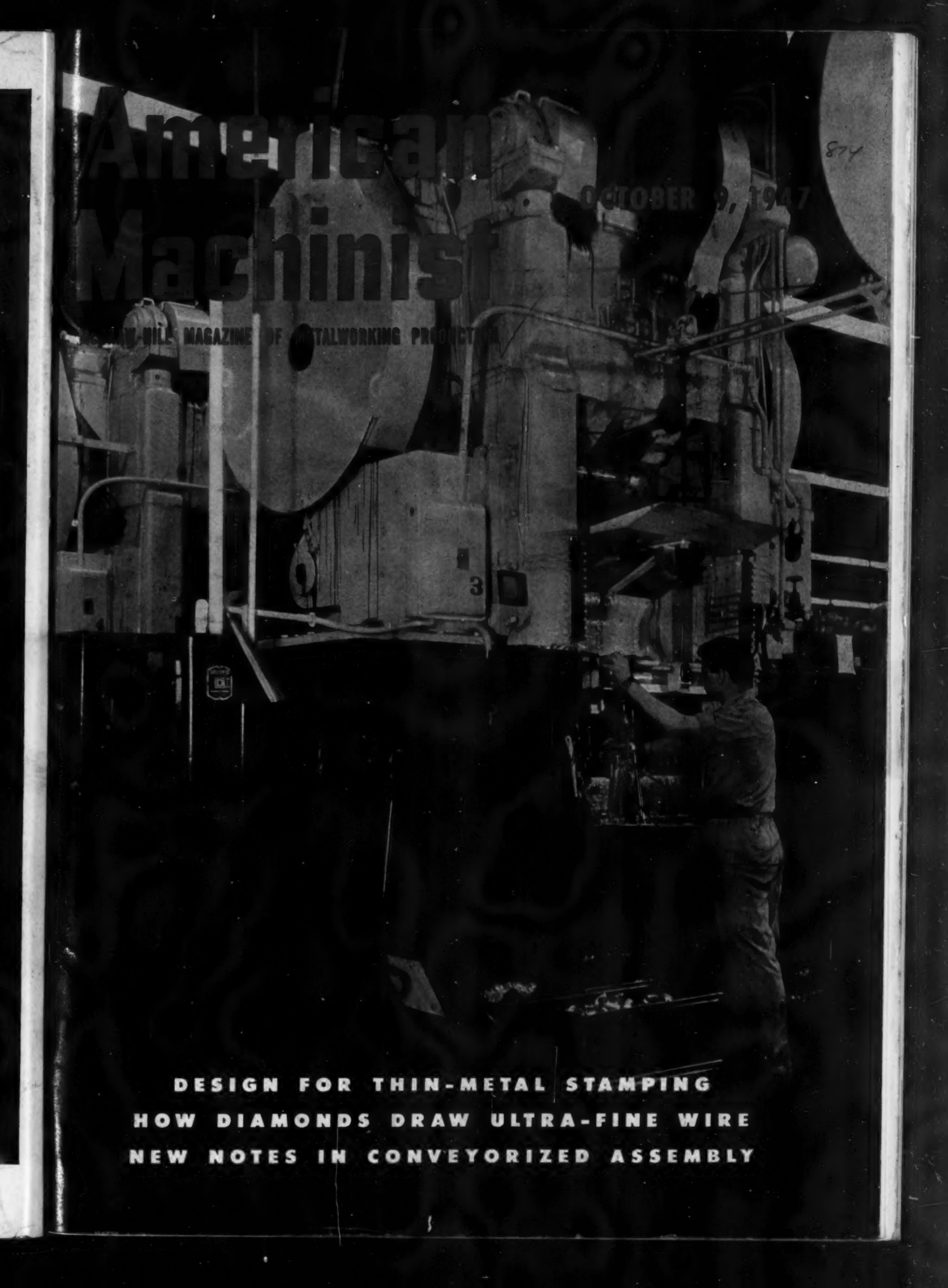
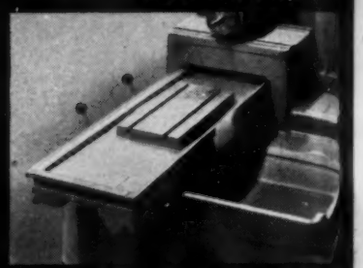

American Machinist
OCTOBER 9, 1947
DESIGN FOR THIN-METAL STAMPING
HOW DIAMONDS DRAW ULTRA-FINE WIRE
NEW NOTES IN CONVEYORIZED ASSEMBLY

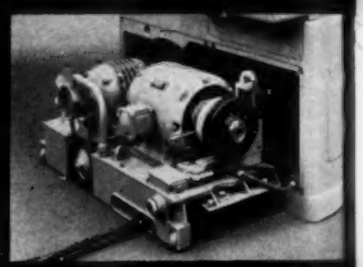
A NEW HEALD BORE-MATIC

FOR MEDIUM TO LARGE SIZE WORK

Centralized controls and adjustable table dogs



Large chip pan for chips and cutting fluid



Isolated power unit rolls out from base

Available in two sizes, either as a single-end or double-end machine

HERE IS THE NEW medium-large Heald Bore-Matic—an outstanding addition to your high-speed, mass production machining requirements. Handles a wide variety of work . . . in single or multiple machining operations . . . including rough and finish boring, turning, facing, chamfering, grooving, or fly cutting.

Below are a few important high-production, low-maintenance features of this new Heald Bore-Matic which serve to put it in a class by itself:

GREATER POWER for heavy roughing cuts and higher speeds for finishing on multiple heads.

EXTREMELY FAST OPERATING CYCLE with very high table traverse speeds, increased boringhead speeds, faster starting and quicker stopping of heads.

UNIFORM HYDRAULIC FEEDS remaining constant throughout the day regardless of oil temperature changes.

INSTANTANEOUS BRAKE TIMING saves boring time and tool wear.

TWO-WAY BORING available with different rates of "in" and "out" feeds by a simple control setting.

These and many other remarkable features make the new Heald Bore-Matic "tops" in production, "tops" in finish, "tops" in accuracy. Get further information at the Heald branch office nearest you, or write:

SEND FOR BULLETIN on new Heald No. 221-321 Single-End or No. 222-322 Double-End Bore-Matic. *Lists applications, features, specifications.*

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means more precision . . . less cost

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INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

TECHNOLOGY DEPARTMENT

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Member of the Associated Business Papers and the Audit bureau of Circulations.

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Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A. Return postage guaranteed.

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PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y. Cables: "McGRAW-HILL, NewYork"

James H. McGraw, Jr., President; James H. McGraw, Founder and Honorary Chairman; Curtis W. McGraw, Senior Vice-President and Treasurer; Nelson Bond, Director of Advertising; Eugene Duffield, Editorial Assistant to the President; Joseph A. Gerardi, Secretary; J. E. Blackburn, Director of Circulation.

Chips and QUIPS

Our Cover . . . A 550-ton press at the Cleveland Graphite Bronze Company is pictured on our cover. It is used in final forming, or upsetting, of automotive engine sleeve bearings. The Kodachrome was taken by the Lamp Dept., General Electric Company, which provided plant lighting. Cleveland Graphite Bronze not only cleans lighting equipment at double the usual frequency (quarterly rather than semi-annually) but also keeps its machines painted and its wall surfaces clean. The result is, inevitably, more efficient plant operation and reduced worker fatigue.

Correction . . . T. S. Nabstedt of The Snow-Nabstedt Gear Corp. calls attention to an inaccuracy in the material furnished us to describe the Kodachrome of induction gear hardening at his plant (*A.M.* cover, August 14). Their gears are not made of SAE 3460, as our informant told us, but are of nickel-moly steel. A gear of 3460 would be useless because the teeth would harden all the way through and the Cr. content would make the heat soak in. On the other hand, pinions of 8620 can be carburized to a hardness of 60 Rockwell C, and gears of 8640 can be hardened to 50 to 55 Rockwell C.

Carbide Cutting Tricks . . . Some months ago, we had first reports on a radically new type of toolholder for carbide rounds, squares and triangles, by which the end of the shape—not the side—did the cutting. Rupert LeGrand sleuthed on the job and now has the details from Buick. They are presented in this issue in a 4-page picture story. . . . Another carbide trick, this time from England, is here also. It describes Ericsson Telephones' method of fitting carbides for machining small parts.

Cost Reduction . . . James K. Matter, after months of requesting on our part, has put together a series of articles on cost reduction for tool engineers. The first, on reducing scrap, appears to introduce the group—and to suggest the scrap problem as the quick and logical point of attack.

Diamond Drawing . . . For the new ultrafine wire sizes from 0.0005 to 0.002 in., the diamond die is king—for a "pick" (or flaw) neither visible nor feelable can cause wire rejection or failure. Robert L. Zahour of North American Philips has prepared for us—hence for you—a special report, describing step by step how to make the dies, then how to draw the wire. If you're working on a problem in that sub-size range, here are some worthwhile pointers.

More Savings . . . Cutting oil can be costly—or cheap—depending on sensible handling. Parker Appliances uses a batch system of reclamation, with excellent results. . . . Also in this issue are a pair of reference book sheets detailing safe use of portable grinders and part 2 of Ernest Fay's "Common-sense Quality Control," as handled at John Deere Tractor. . . . Some novel ideas in conveyorized assembly, collected in Detroit by Chester Ricker, are presented for you, accompanied by the inimitable Ricker sketches, so "getting the idea" is eased and speeded.

Coming . . . Oct, 23 *A.M.* will include a variety of short articles—giving more subjects than usual. Included is a story on form-milling cutters, one on multiple-position coils for induction hardening (which ends Frank Curtis' series of three), one on odd uses for a gear shaper, the machinery replacement plan of Dodge Mfg. Corp., a description of materials handling at Kaiser Frazer, James Matter describing a tricky and useful gadget for tool engineers—the tolerance chart, more on thin-metal stamping by Wallace Mills, and so on. You'll like it.

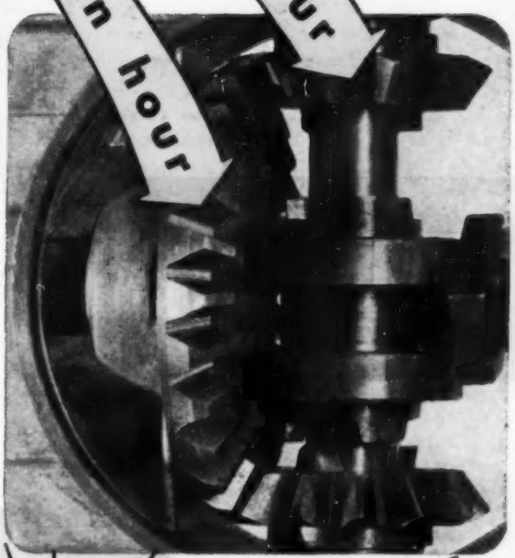
ROBERT L. ZAHOUR, electrical engineer, associated with North American Philips Co., Inc., New York, as technical-commercial manager of the Wire Div., after graduating from Case School of Applied Science in 1923 with a B.S. degree in electrical engineering, joined the student engineers course at Westinghouse Lamp Co. in Bloomfield, N. J. He has followed a career of finding scientific applications for new laboratory developments and has toured the country giving lecture-demonstrations before engineering and civic groups related to wire and new lamp developments. He is the author of articles and engineering papers for publication in technical and scientific magazines. In 1930 he was awarded his master's degree at Case.

FASTEST EQUIPMENT EVER DEVELOPED

FOR CUTTING STRAIGHT BEVEL GEARS

86 an hour

49 an hour



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High quantity production of straight bevel gears such as those for the household washer... from blank to finished gear, including burring . . . cut from the solid by means of a single cutter carrying both roughing and finishing blades . . . the No. 8 Straight Bevel Revacycle Machine is entirely automatic, equipped with loading device and hydraulic chucking.

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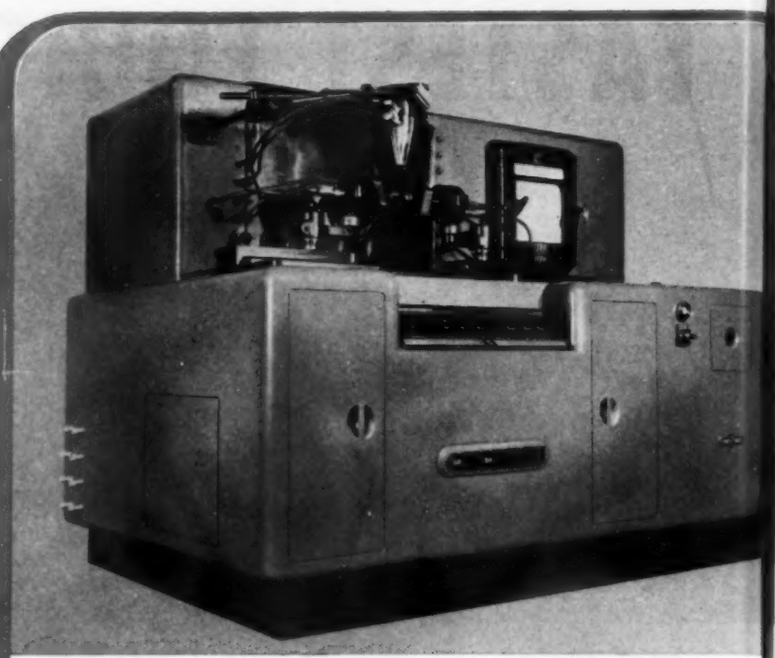
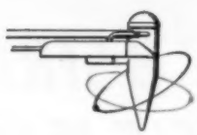


PATENTS PENDIN

ANNOUNCING THE CINCINNATI FLAMATIC HARDENING MACHINE

THE CINCINNATI
flamatic
HARDENING MACHINE



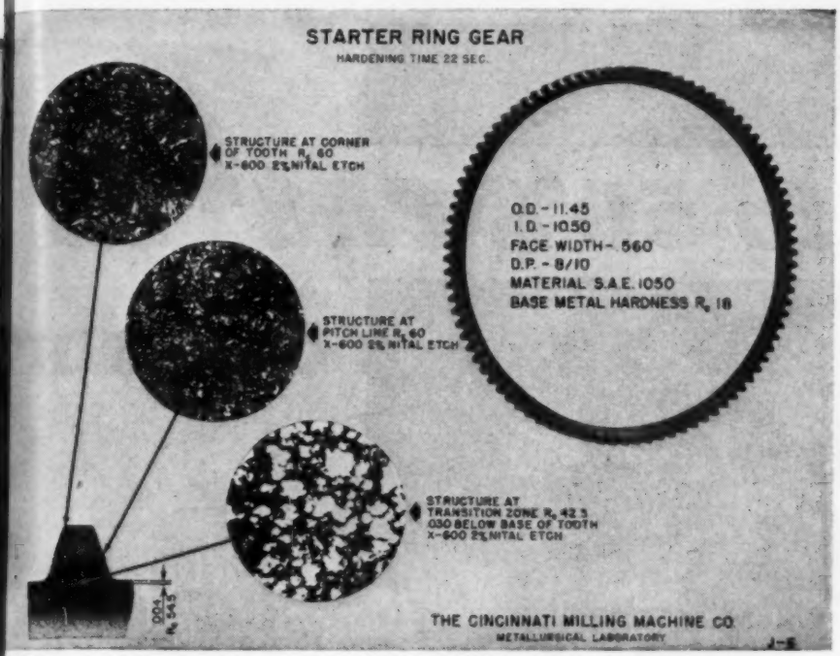
a new flame hardening machine with electronic temperature control . . .

Here, for the first time, is a machine for flame hardening parts in production quantities, that holds metallurgical specifications and dimensional tolerances previously impractical with flame hardening. By means of electronic temperature control, the Flamatic permits rapid heating of surfaces of parts to desired preset temperature, followed by an oil quench . . . Full surface hardness is developed. Heat penetration is controlled within narrow limits. Core properties are left undisturbed and distortion is negligible. Operation is fully automatic except for loading of parts . . . Field-tested in many plants, the Cincinnati Flamatic has proved its extraordinary economy and speed in processing a wide range of gears, pinions, shafts, and similar parts.

CINCINNATI

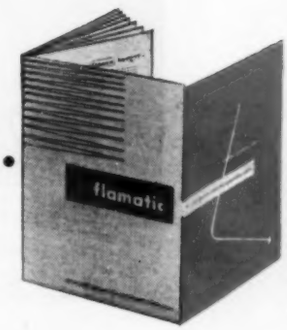
• SEE THE FLAMATIC IN OPERATION AT THE METALS SHOW, CHICAGO AMPHITHEATRE, OCTOBER 18-24: BOOTH 2702

• SEE THE FLAMATIC IN OPERATION AT THE METALS SHOW, CHICAGO AMPHITHEATRE, OCTOBER 18-24: BOOTH 2702

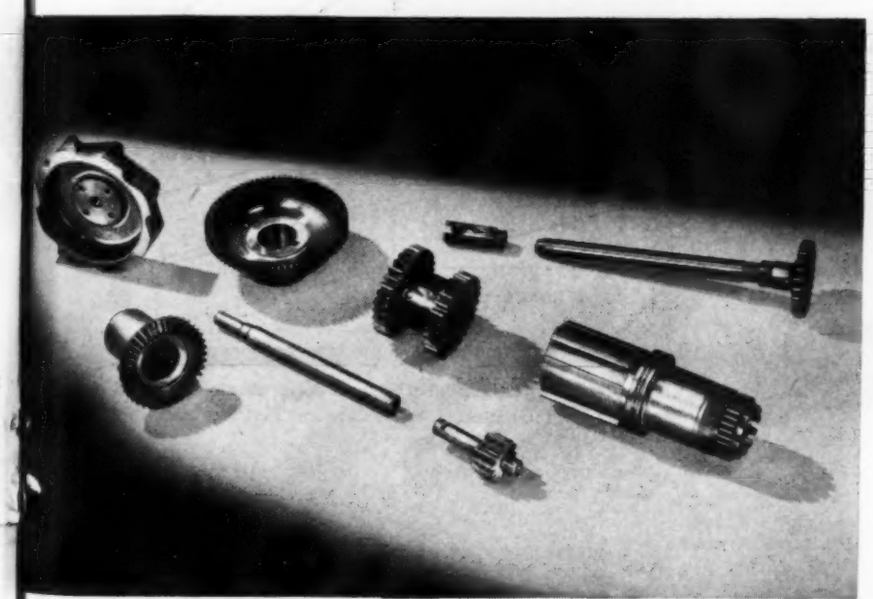

STARTER RING GEAR
HARDENING TIME 22 SEC.
STRUCTURE AT CORNER OF TOOTH R, 60 X-600 2% NITAL ETCH
STRUCTURE AT PITCH LINE R, 60 X-600 2% NITAL ETCH
STRUCTURE AT TRANSITION ZONE R, 42.3 .030 BELOW BASE OF TOOTH X-600 2% NITAL ETCH
O.D. - 11.45
I.D. - 10.50
FACE WIDTH - .560
D.P. - 8/10
MATERIAL S.A.E. 1050
BASE METAL HARDNESS R, 18
.005 R, 54.5
THE CINCINNATI MILLING MACHINE CO.
METALLURGICAL LABORATORY

High surface hardness is achieved in this starter ring gear shown in a typical report from The Cincinnati Milling Machine Co. metallurgical laboratory.

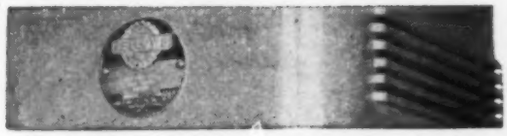
Your request for a new complete descriptive catalog—Publication No. M-1611—will be answered promptly.



The machine will accommodate parts that lend themselves to rotation, generally up to 8 inches diameter, or up to 18 inches long.

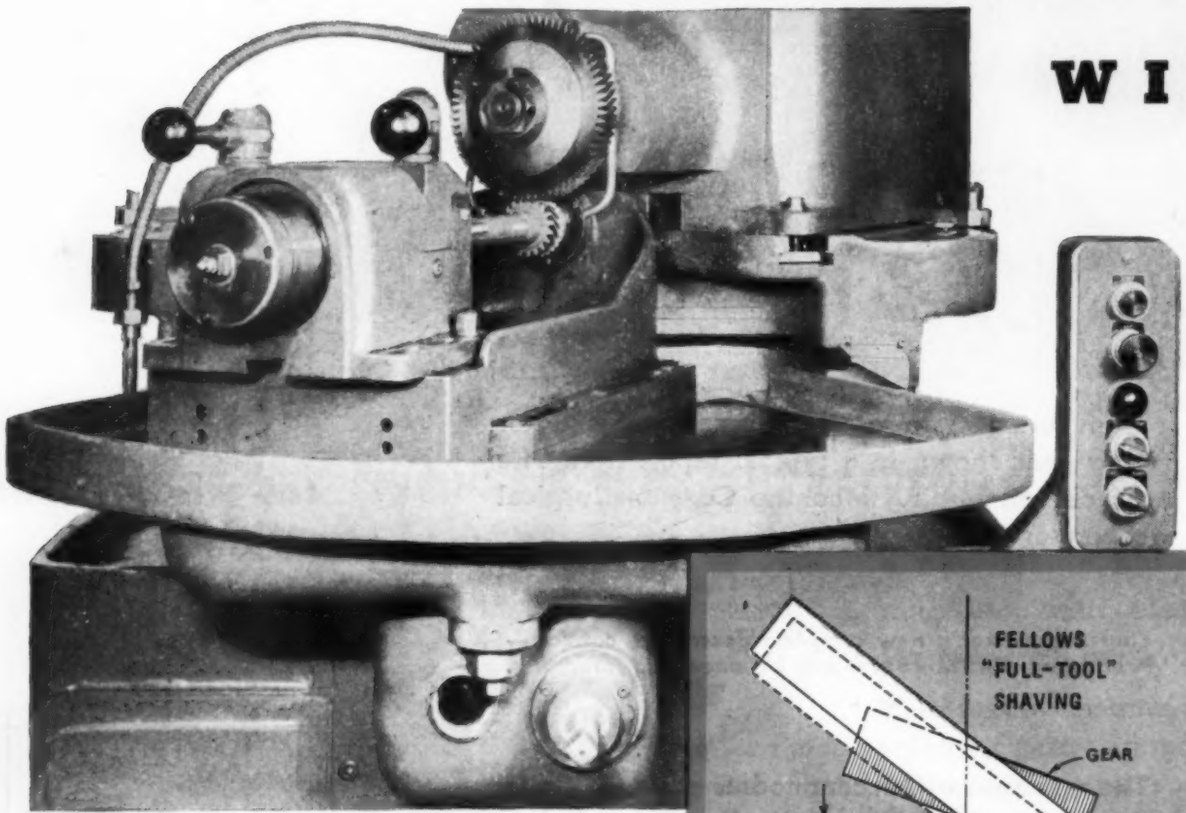


THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U.S.A.

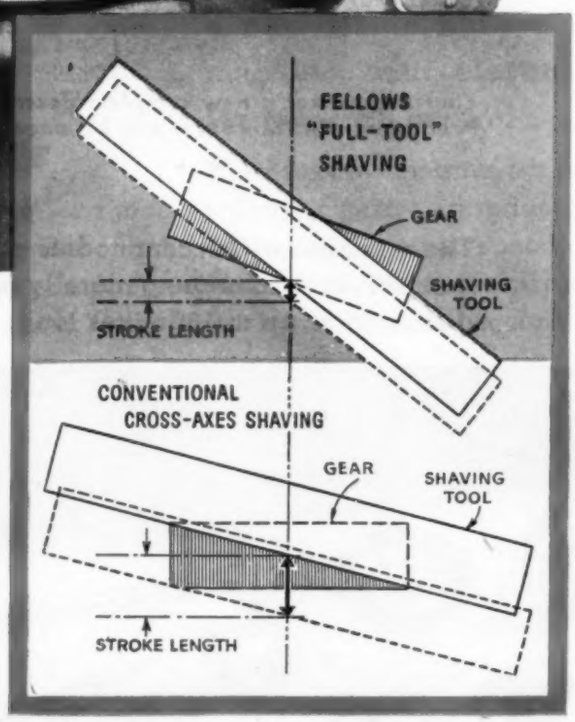


25% to 50% FASTER

WITH



No. 8 Fellows "Full-Tool" Gear Shaving Machine.



Simplified diagram showing relative positioning of gear and shaving tool indicating shorter stroke for "Full-Tool" shaving.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

SHAVING...

LONGER TOOL LIFE

★ Fellows "Full-Tool" Shaving Speeds Gear Production —Improves Finish

Lower-cost shaving assumes new importance as a mass production finishing process. In the Fellows "Full-Tool" Method, (as illustrated in the accompanying diagram) the face of the gear tooth is precision-shaved with a much shorter reciprocating stroke than by conventional crossed-axes shaving. Another advantage is the fact that the cutting-action is broadly distributed over the face width of the tool, resulting in longer tool life. The shorter stroke and freer cutting permits higher reciprocating speeds... faster output.

Every production man considering shaving as a finishing process will want complete information on the Fellows "Full-Tool" Method. Write: The Fellows Gear Shaper Company, Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2, 640 West Town Office Bldg., Chicago 12, 7706 Empire State Bldg., New York 1.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI 10" HYDRAULIC UNIVERSAL GRINDER

FILMATIC

EVERY SHOP NEEDS A TRULY UNIVERSAL UNIVERSAL GRINDER

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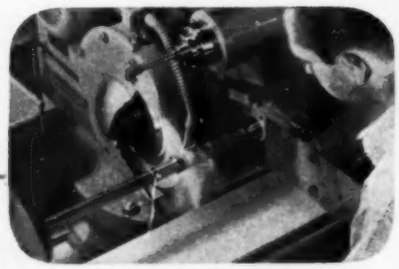
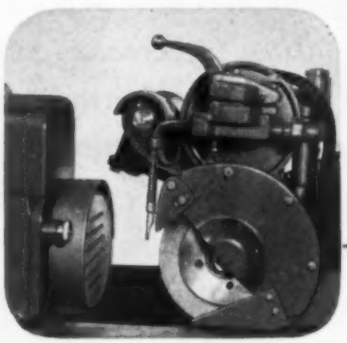
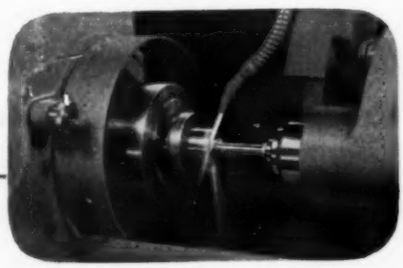
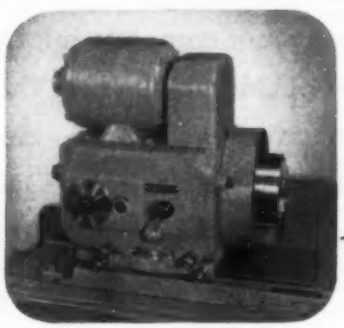




Face grinds with wheel on the right hand end of the spindle (EXTRA EQUIPMENT)

Grinds Internally with equal facility





Electronic Headstock offers the right speed for the job

These features make the CINCINNATI *FILMATIC 10" Hydraulic Universal a true Universal, and in addition there are many plus features available for high production work. The complete story may be obtained by writing for catalog No. G-549-1. Right: FILMATIC 10" Hydraulic Universal Grinder.*

CINCINNATI GRINDERS INCORPORATED

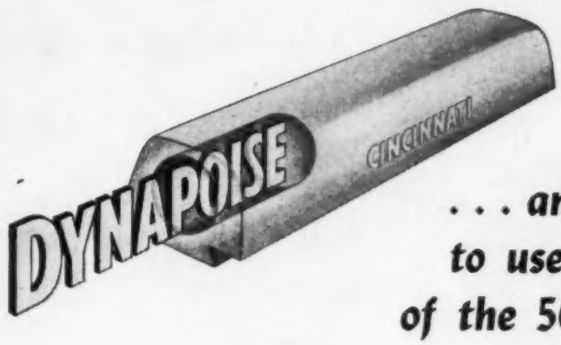
CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES CENTERLESS GRINDING MACHINES

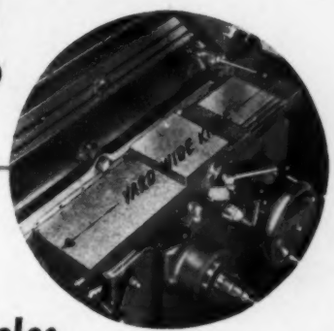
CENTERLESS LAPPING MACHINES

CINCINNATI DUAL POWER DIAL TYPE MILLING MACHINE

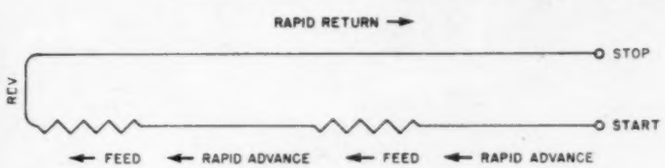
50 hp drive

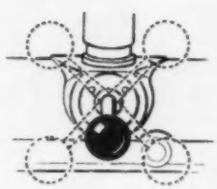


. . . and rugged construction to use all of the 50 hp



. . . you also get
Automatic Table Feed Cycles





These three big features, and many more . . . including single lever selection of speeds and feeds, by power at the front and rear operating position; wide speed and feed ranges for both high speed steel and sintered carbide cutters . . . are incorporated in CINCINNATI *Dual Power Dial Type Milling Machines. That's why they can take over such a big proportion of work in many shops. Catalog No. M-1569, containing complete information, will be sent on request. Left:* CINCINNATI *50hp Plain Dual Power Dial Type Milling Machine.*

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES **BROACHING MACHINES**

CUTTER SHARPENING MACHINES

A Single Investment that

No. 36 with adjustable cutterhead in horizontal milling position. Table: 64 x 14 inches

Van Norman Ram Type Millers are available in 7 Sizes — 18 Models. A Size and Model for every milling requirement.

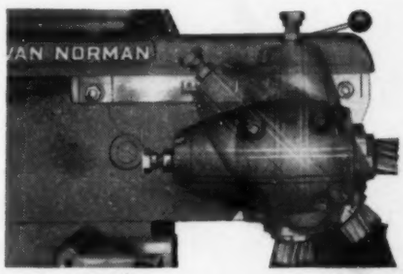
"It pays to Van Normanize"

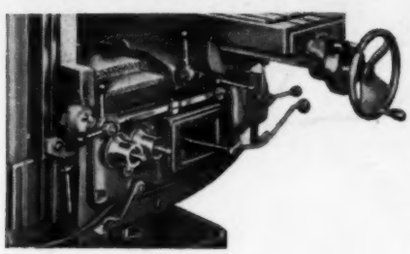
Pays for Itself 3 ways ...

VAN NORMAN
Ram Type Milling Machine

The Van Norman Ram Type Milling Machine quickly pays for itself through time saved in set-ups, elimination of idle machine time and increased production. Not only does it perform conventional horizontal, angular and vertical milling, but it enables operators to carry most jobs through to completion without work reset-ups.

The Van Norman Ram Type Miller is available in many models . . . a machine to fit every requirement in the tool room, machine shop, pattern shop, laboratory or production department.





1. Adjustable Cutterhead

permits conventional horizontal, vertical, as well as angular milling with standard arbors and cutters. This feature reduces set-ups, eliminates idle operator and machine time because there is no waiting for single purpose machines.

2. Moveable Ram

on which the cutterhead is mounted, in combination with the saddle cross-feed, increases the versatility and capacity of the ram type miller. This feature permits the operator to handle larger and unusual work pieces with relative ease and minimum set-ups.

3. Ease of Operation

and convenience of control speed-up milling operations. All power controls, on all machines except smaller models, are located at both front and rear. Dual controls of power feeds reduce worker fatigue, provide maximum safety. These controls are directional—operate in the direction of desired table, saddle and knee movement.

These and other features make the Van Norman Ram Type Miller the most versatile, cost cutting machine available. Write for information.

VAN NORMAN COMPANY

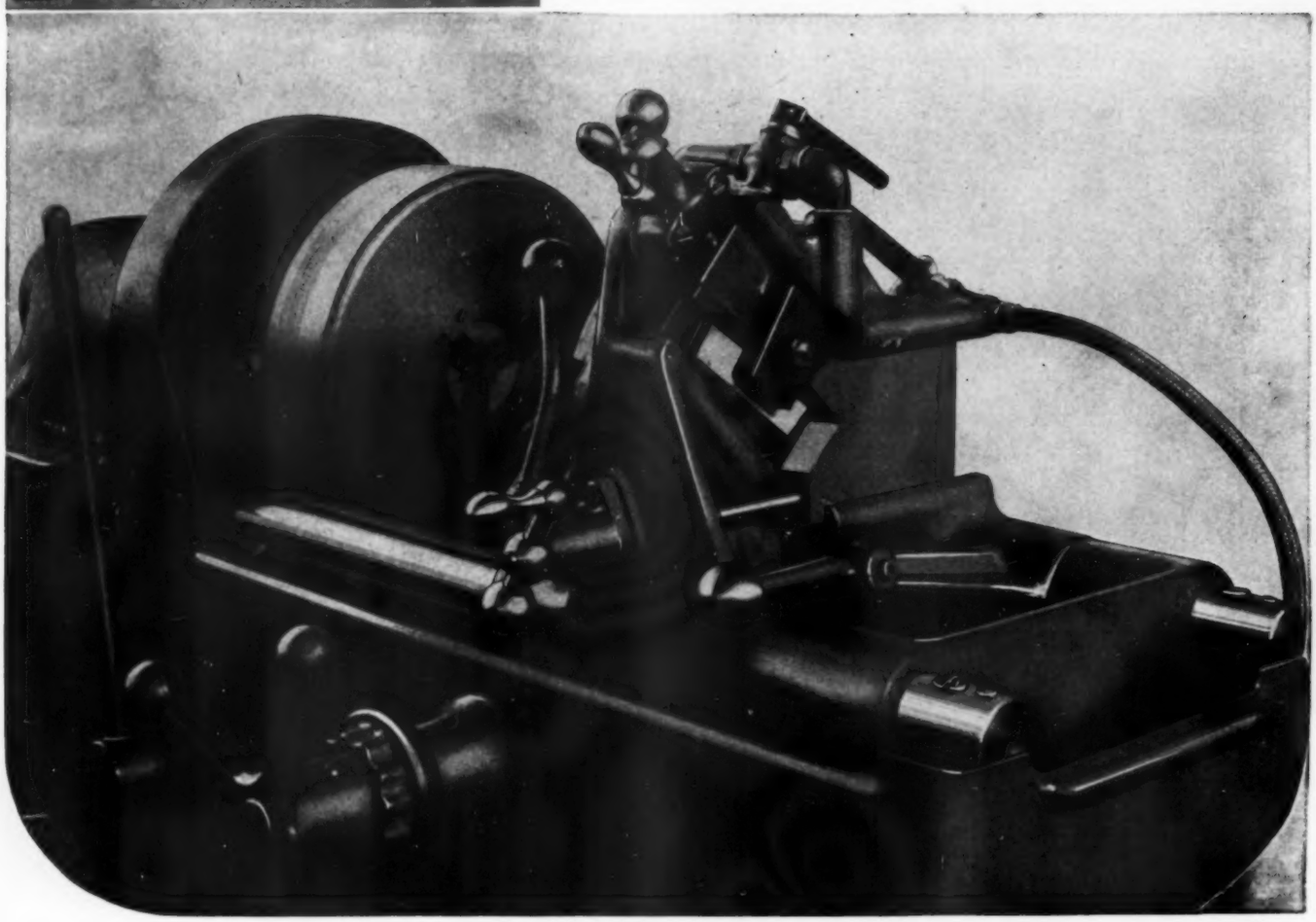
SPRINGFIELD 7, MASSACHUSETTS

The LITTLE LANDIS

For **MAINTENANCE**

and

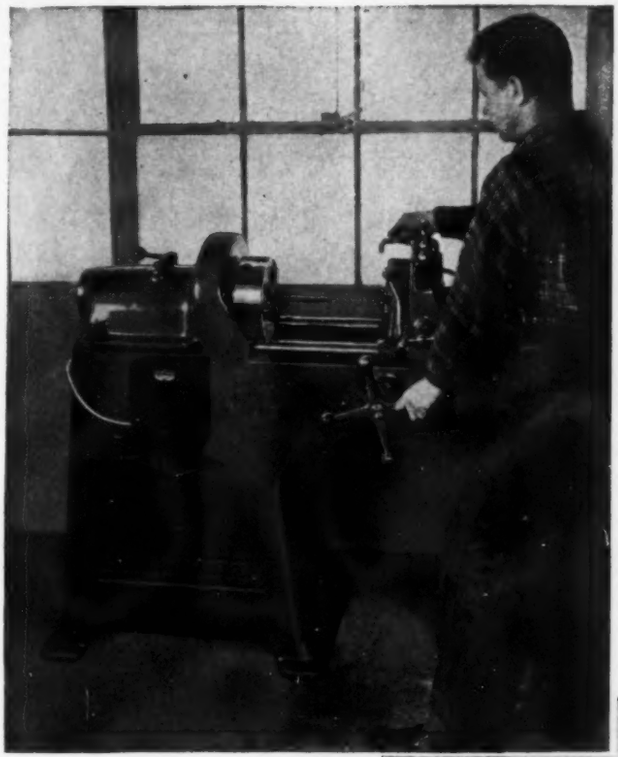
JOBBING



LANDIS
REG. U.S. TRADE MARK PAT. OFF.

LANDIS

Pipe Threading & Cutting Machine



• The LITTLE LANDIS Pipe Threading and Cutting Machine is designed for threading bolts and for cutting off and threading pipe in jobbing and maintenance shops. In the illustrations on this page, the 2" LITTLE LANDIS is producing bolt threads for use in maintenance work.

The LITTLE LANDIS can handle a variety of work at a minimum cost, permit the quickest possible set-up changes, and produce cleanly-cut and well-formed threads on all materials. It uses the Landis Chaser, the only pipe threading die with the same free-cutting action and natural clearance of a lathe tool. This allows for long life between chaser grindings and smooth finish and accuracy in the finished thread.

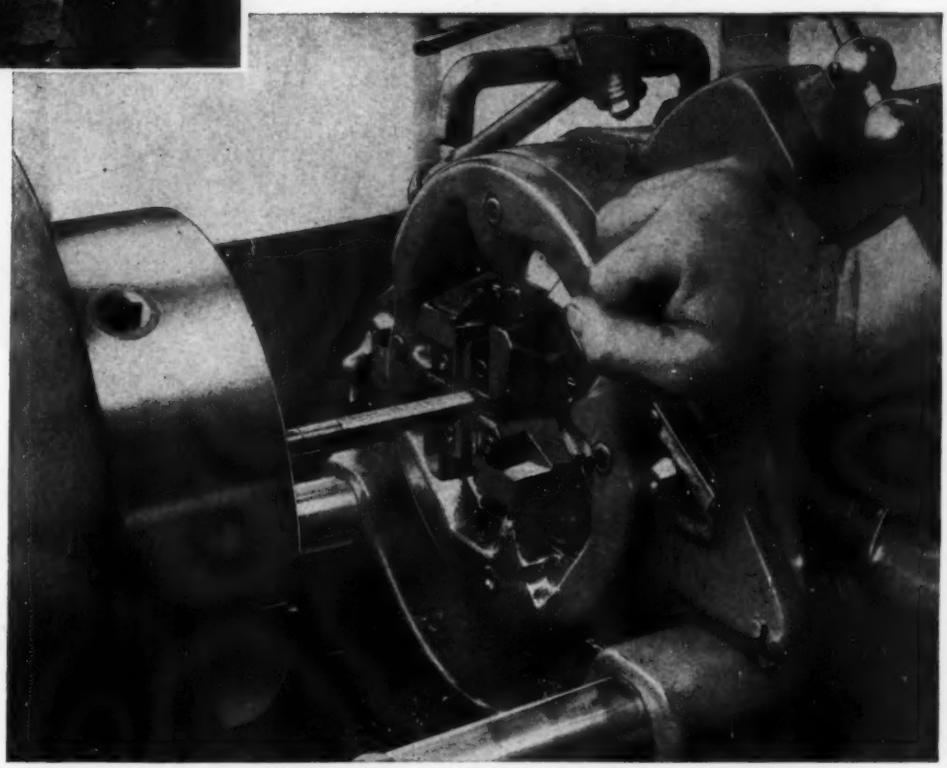
Write for Bulletin C-82

FOR QUICK SET-UP CHANGES...

The 3/4" and 2" Landis Stationary Die Heads, standard equipment with the LITTLE LANDIS, give rapid flexibility in cutting pipe threads within a range of 1/4" to 2" and bolt threads 1/4" to 1 1/4" or 3/8" to 1 1/2".

The die heads are supported on the cross rail and locked securely in position by a latch. They are readily interchanged in a few seconds.

The Stationary Die Heads are quick-opening, with opening and closing controlled through a lever on the side of the head. Size adjustment is universal, made through a self-locking hand-wheel.

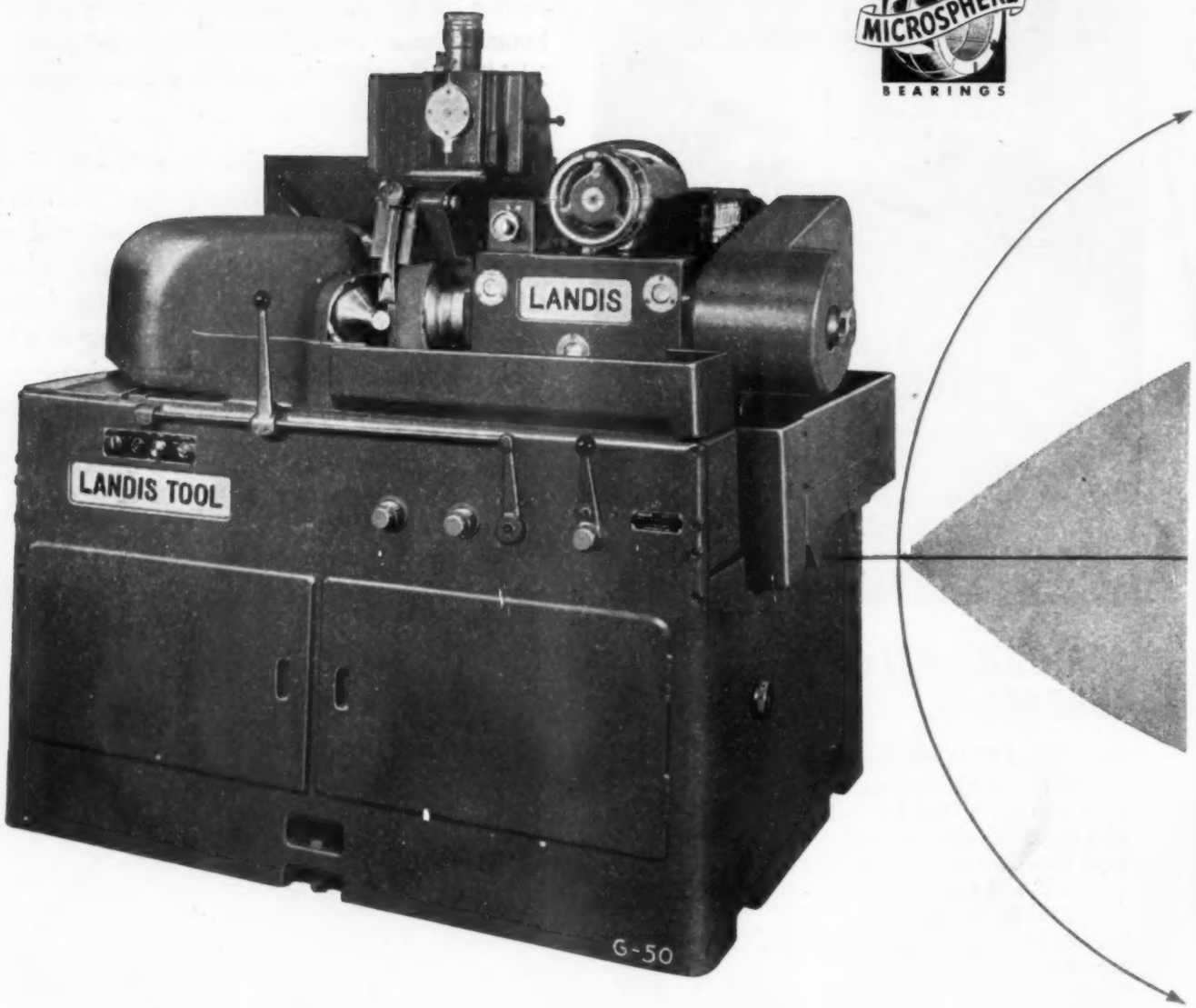


MACHINE CO. WAYNESBORO PENNA. U.S.A.

SEMI-AUTOMATIC VALVE GRINDER

operator loads and unloads only

EQUIPPED WITH MICROSPHERE BEARINGS



H Type Valve Grinder/Bulletin CG47

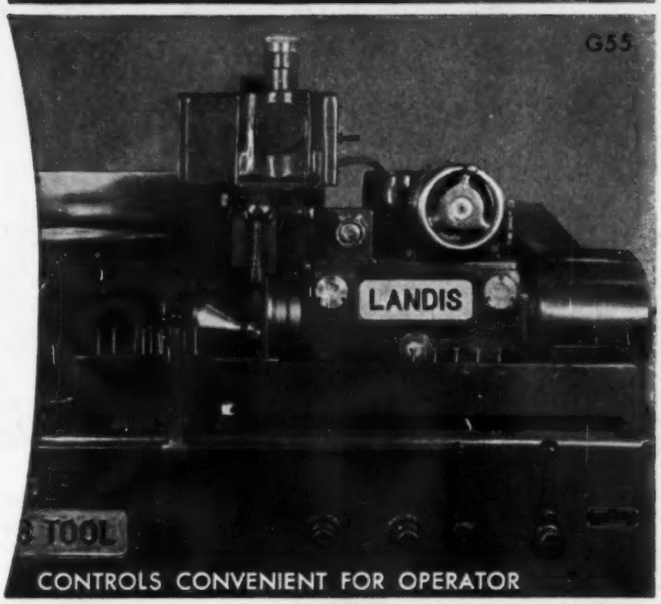
LANDIS TOOL
Precision Grinders

If you have a precision grinding problem, production estimates and tooling suggestions will be made on the basis of your blueprints.

Semi-Automatic Operation

(continuous rotation of head)

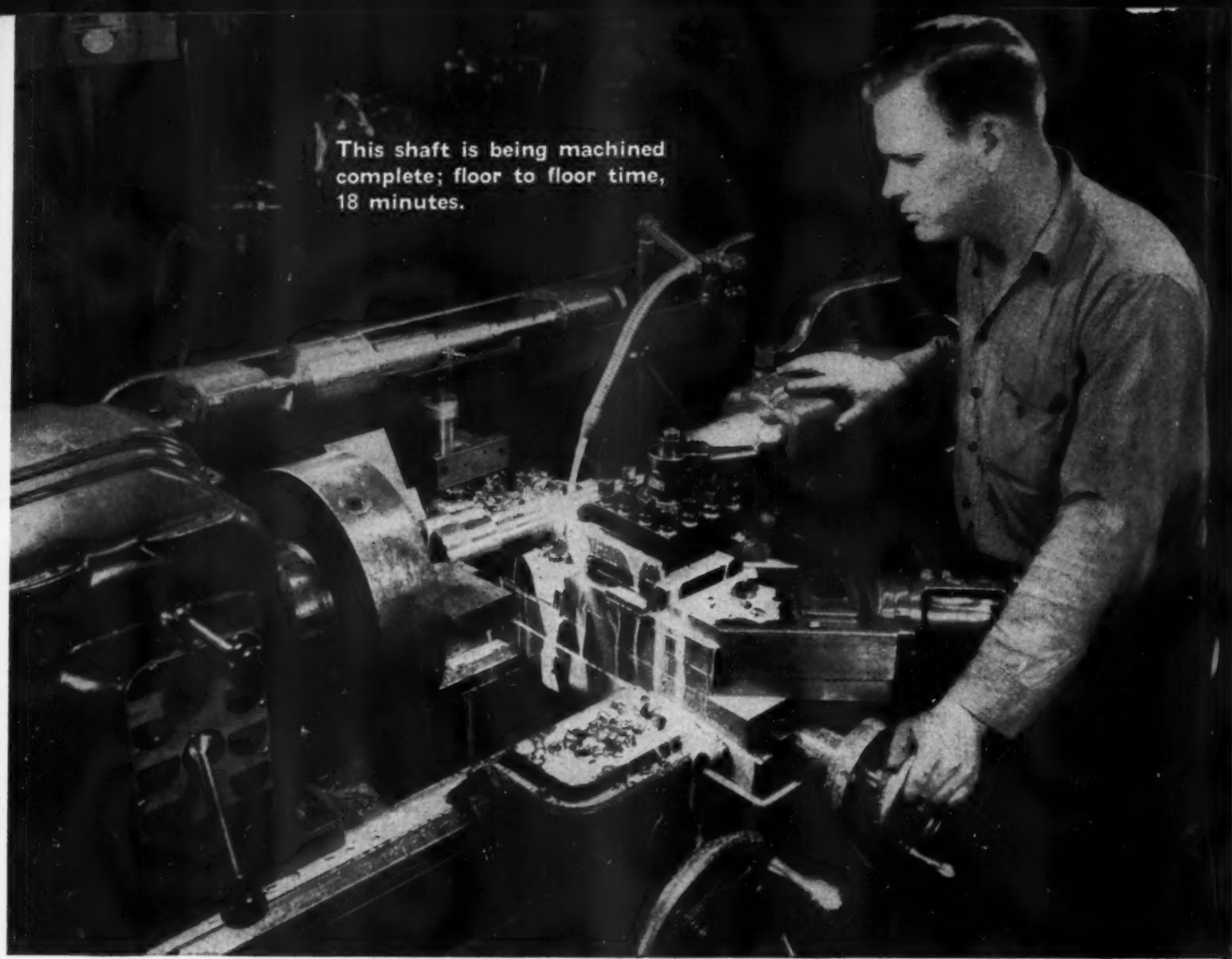
1. Operator loads valve in chuck.
2. Operator starts grinding cycle.
   - (a) Hydraulic chuck closes.
   - (b) Rapid feed moves wheel to grind position.
   - (c) Slow grinding feed starts and continues to finish size against positive stop.
   - (d) Hydraulic timer starts—times length of spark-out.
   - (e) Wheel recedes automatically, grinding feed re-sets.
   - (f) Hydraulic chuck opens.
3. Operator unloads chuck.
4. Repeat.



CONTROLS CONVENIENT FOR OPERATOR

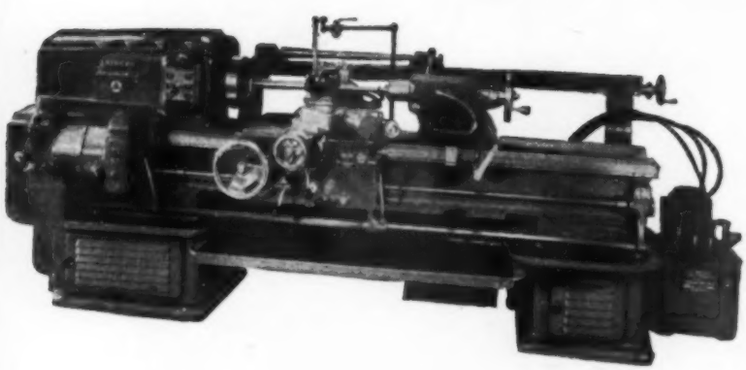
ELECTRIC MOTORS and CONTROLS BUILT-IN

LANDIS TOOL COMPANY WAYNESBORO, PENNA.



SHAFT PRODUCTION COSTS

CUT TO THE BONE...



The new "American" "H S-D" (Hydraulic Shaft-Duplicating) Lathe presents to the metal-working industry a new and revolutionary technique for the production of various types of shafts. Other methods are now outmoded by this new development. Production costs have hit a new low. Piston rods that formerly took over 4 hours are now produced on this lathe in 36 minutes.

• **Write for descriptive literature—Bulletin No. 35**

THE AMERICAN TOOL WORKS CO.

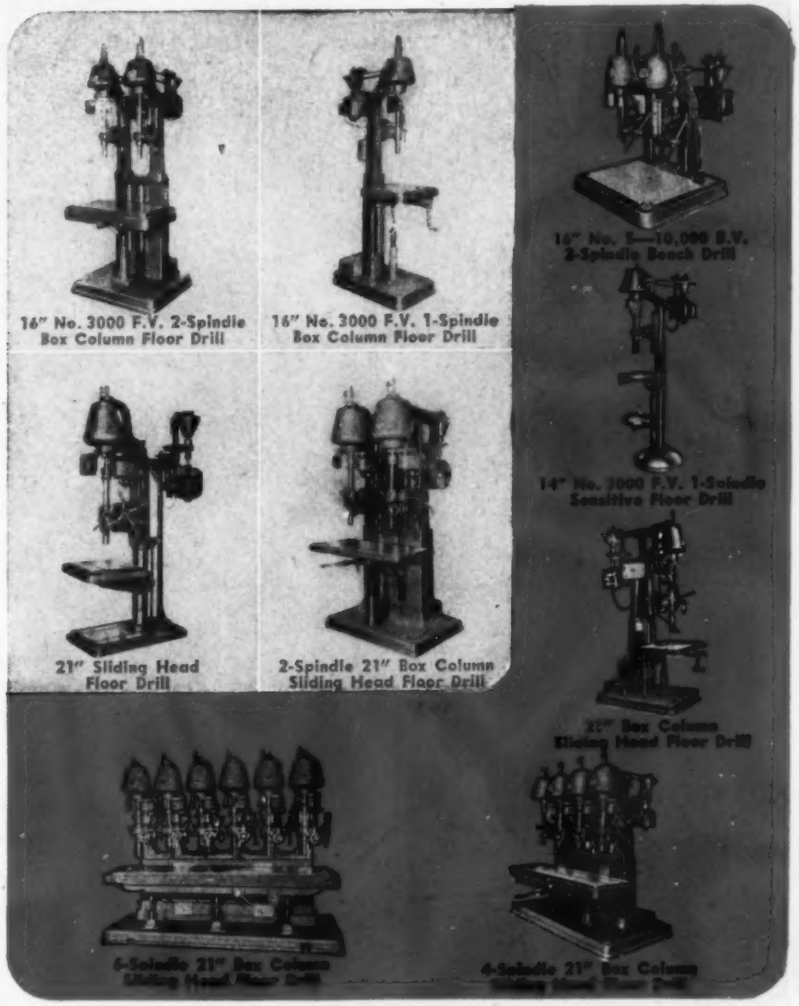
Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

DRILL PRESSES by Canedy -OTTO

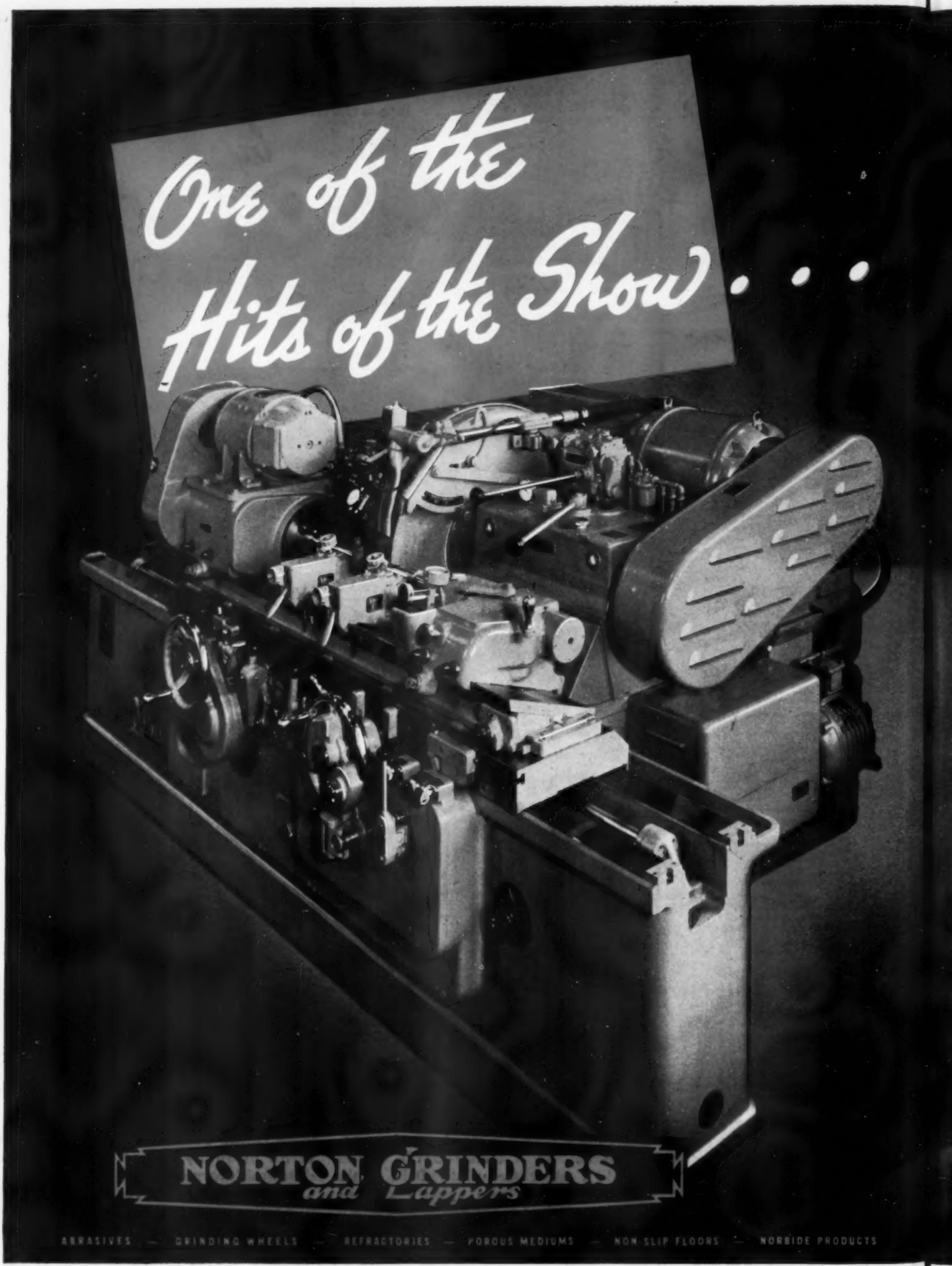
C THE WORLD OVER O

WORLD'S MOST COMPLETE DRILL PRESS LINE


16" No. 3000 F.V. 2-Spindle Box Column Floor Drill
16" No. 3000 F.V. 1-Spindle Box Column Floor Drill
16" No. 5—10,000 R.V. 2-Spindle Bench Drill
14" No. 3000 F.V. 1-Spindle Sensitive Floor Drill
21" Sliding Head Floor Drill
2-Spindle 21" Box Column Sliding Head Floor Drill
21" Box Column Sliding Head Floor Drill
4-Spindle 21" Box Column
4-Spindle 21" Box Column

Drill presses, bearing the familiar CANEDY-OTTO name, are found in factories the world over — testifying to the world-wide, long-time acceptance of CANEDY-OTTO, "The World's Most Complete Drill Press Line." Before you specify or approve any drill press purchase, make a careful review of the CANEDY-OTTO line — a line providing an economical, standard unit for a very wide range of drilling requirements. Write us today for catalog, putting detailed information on the complete CANEDY-OTTO Drill Press line at your fingertips.

CANEDY-OTTO MFG. CO. CHICAGO HEIGHTS, ILL.


One of the
Hits of the Show . . .
NORTON GRINDERS
and Lappers
ABRASIVES — GRINDING WHEELS — REFRACTORIES — POROUS MEDIUMS — NON SLIP FLOORS — NORBIDE PRODUCTS

The *new* NORTON TYPE CTU CYLINDRICAL GRINDERS

PERHAPS you saw them in action yourself at Chicago, saw how they were designed for your *maximum convenience* — easy to operate, easy to maintain — and to give you *minimum production costs.*

Whether your production requirements are large volume or small you'll like the steady, dependable operation of the new Norton Type CTU's. Their ability to produce high accuracy at high speed assures the favorable work cost that is so essential to meet today's competition.

The Type CTU's are available in swing capacities of 6" and 10", in several lengths in each, and either plain or semiautomatic arrangements. Catalogs giving further details on request — no obligation.

NORTON COMPANY, WORCESTER 6, MASS.
Distributors in All Principal Cities

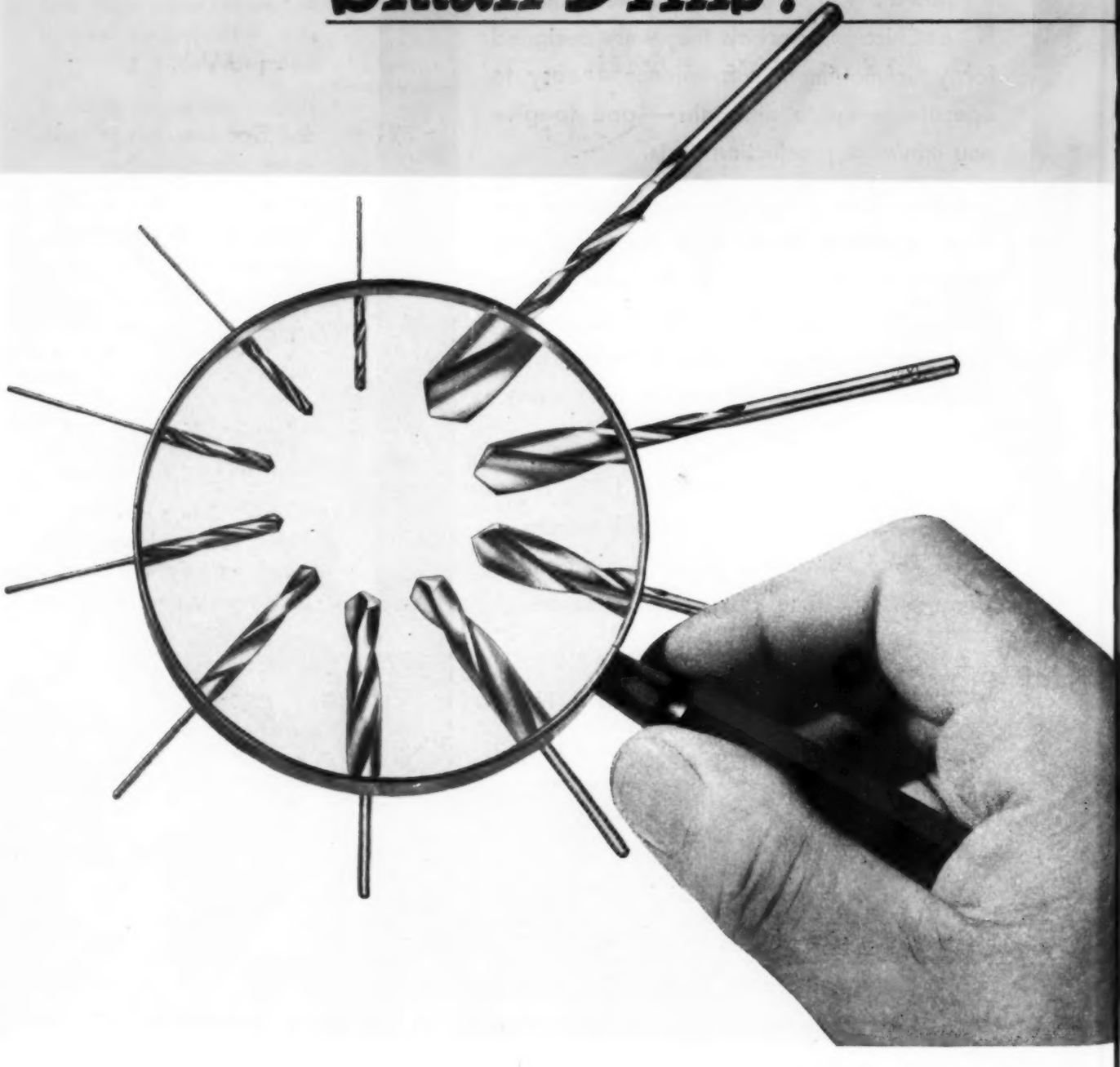
M-552

DESIGN HIGHLIGHTS of the Type CTU

- Base ways protected at all times by space-saving steel strip guards.
- Smooth all Vee-belt driven headstocks.
- Separate right and left hand table dwell controls.
- Automatic wheel feed at each table reversal.
- Automatic coolant control.
- Automatic work start and stop with jogging control also provided.
- Hinged wheel guard cover and rear base design facilitates wheel changes.
- Wheel feed controls easily operated and conveniently grouped.
- Sensitive, easily operated hand table traverse.
- Piston rods always in tension —no buckling.
- Pumps and electrical equipment located for maximum accessibility.
- Sizing accuracy and finish maintained by well proportioned design.

LABELING MACHINES (BEHR-MANNING DIVISION) COATED ABRASIVES AND SHARPENING STONES

Magnifying Glass Shows Clue to Lower Costs with Small Drills!



Morsé "Multi-Inspection-Test-Control"

Provides Peak Small Drill Quality for ACCURATE Hole Size

We've placed these little fellows under the magnifying glass for a better look. Morse checks and tests and checks again, at every step of the manufacturing process. When a drill has been okayed by the Morse multi-inspection system, the user is certain of a small drill made to the closest tolerances — a tool that's dimensionally accurate with just the right degree of hardness and toughness — a drill that's scientifically ground and precision pointed.

Remember too, Morse small drills are *double-drawn* for increased toughness while maintaining their predetermined degree of hardness . . . and given special heat treatment to assure uniformity. Result: tools that appreciably lower small part production costs and step up "line" efficiency via *accurate* size holes drilled faster.

Whether your needs call for "bantam" size drills or the big Morse "block busters," Morse has the tool to cut down your costs. Your Industrial Supply Distributor can aid you in obtaining the proper Morse recommendation for *your* job on small or large drills and other high quality cutting tools.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

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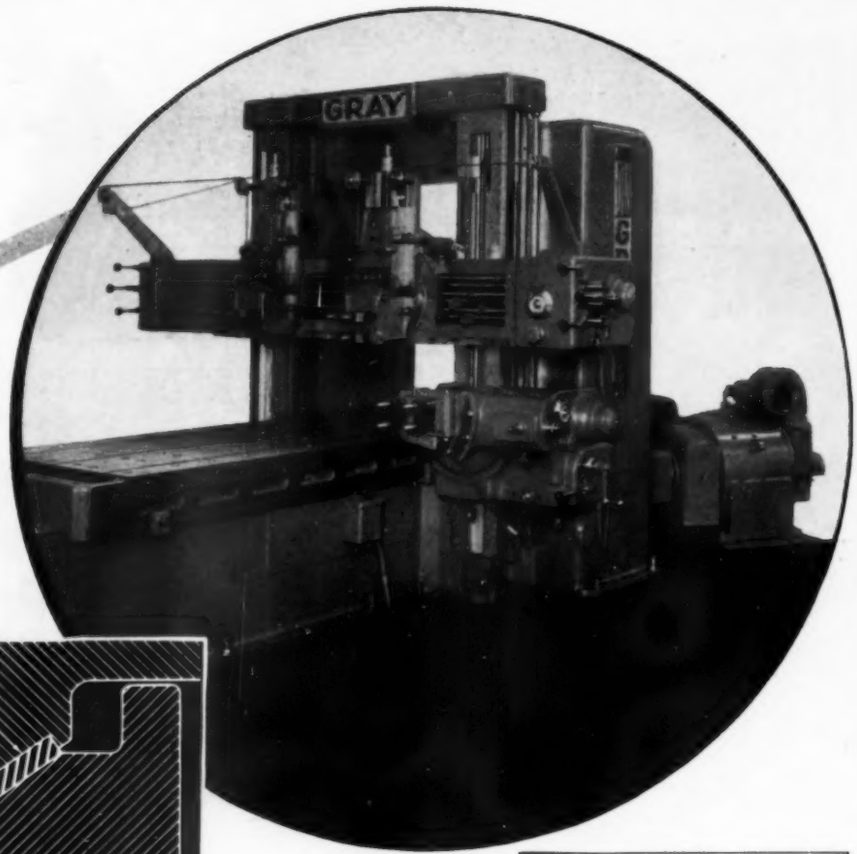
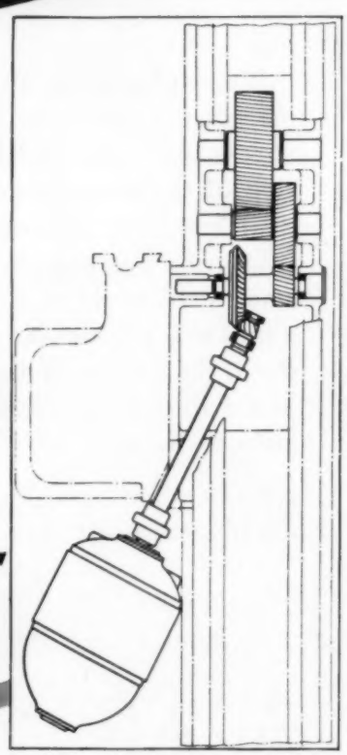
3 OUTSTANDING GRAY FEATURES



STOP SCORING *with the Gray Non-Metallic Ways*

INSURE PROPER LUBRICATION *with Gray Loop Lubrication*



SAVE SPACE *with the Gray Space Saver Drive*

The G.A. GRAY *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION TOOL ROOM LATHE

TAKES THE "ART" OUT OF THREAD CUTTING

An expert at cutting threads becomes an "artist" when success is dependent on the operator and not the machine. The Hardinge TL High Speed Precision Tool Room Lathe changes this situation because it has the thread cutting ability which enables a lesser skilled operator to produce good threads rapidly.

The Gear Box on the Hardinge TL Lathe provides quick change for all the standard threads above and including eleven per inch.

Features of the Hardinge TL Lathe for high speed thread cutting, turning and boring are:

1. No radial or axial spindle play.
2. Dove-tail construction eliminates chatter and vibration.
3. Wide range of speeds for small or large diameter work.
4. No radial or axial lead screw play.
5. Instantaneous control of the carriage.
6. Quick acting arrangement for tool post slide.

Write for Hardinge TL Bulletin which gives complete specifications.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

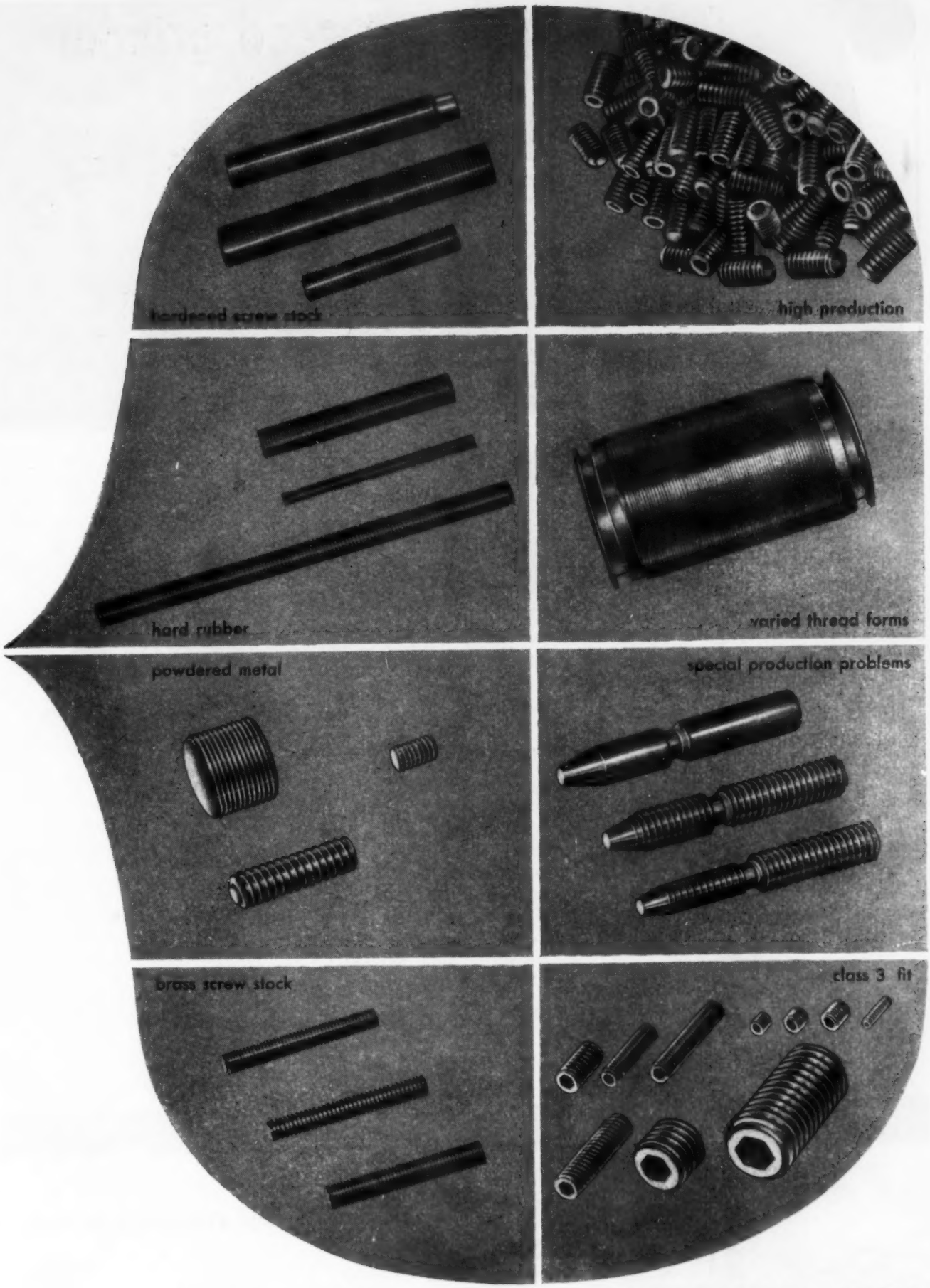
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

LANDIS TOOL centerless thread grinder

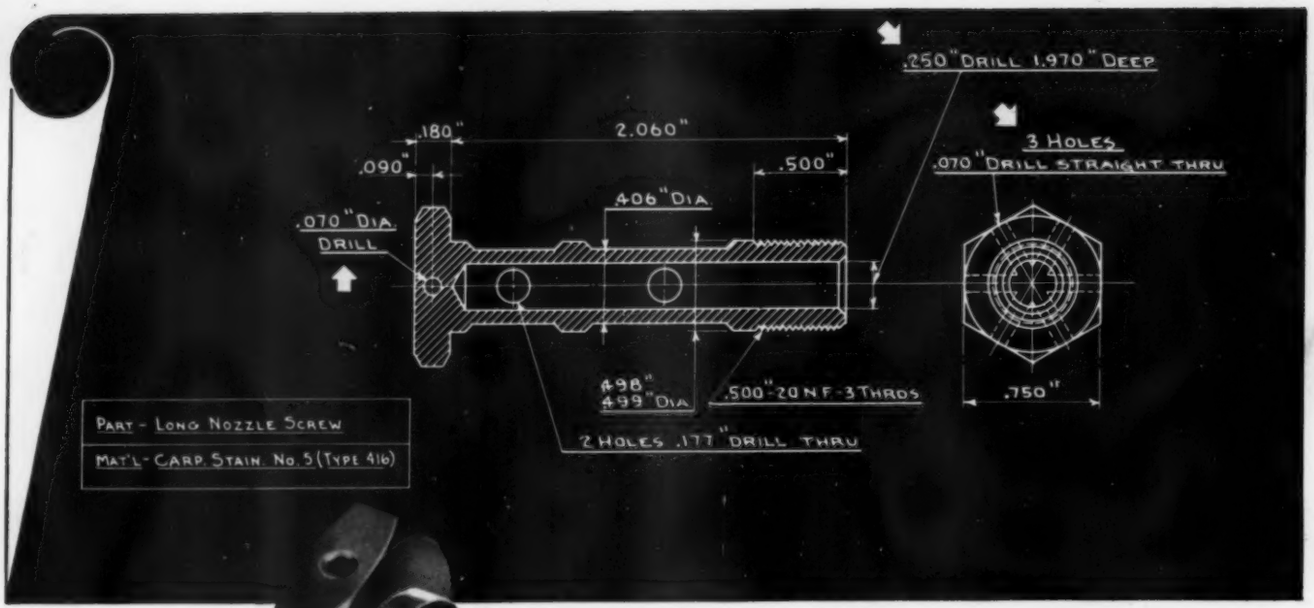
solves varied thread grinding problems

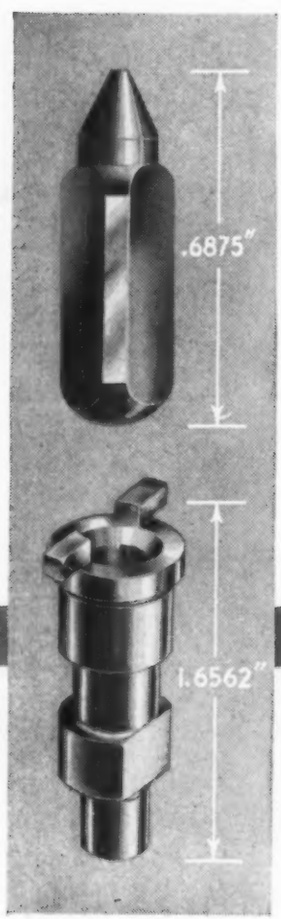
LANDIS TOOL

Precision Grinders



LANDIS TOOL COMPANY, WAYNESBORO, PENNA.





you can turn it out

at less cost

with Carpenter Free-Machining Stainless

more than corrosion resistance

available for prompt shipment from stock

3 ways to CUT COSTS on your Stainless Jobs . . .

1 For the real economy you want on every job today, double-check the Stainless you are using. To offset other rising production costs, you will want a Stainless that always behaves well in your machines. By getting in touch with Carpenter, you can make full use of the fabricating advantages that come with Stainless that is always uniform. A call to your Carpenter warehouse is a big step to lower costs with Stainless.

2 Whether you want corrosion resistance, heat resistance or other properties, select the most *economical* type of Stainless for your job. In other words, it does not always pay to buy an 18-8, or any other type, just because it has been used in the past. Take a *new* look at your Stainless needs. To bring down your cost of using Stainless, put Carpenter's long experience to work today.

3 When confronted by a brand new job having to do with Stainless selection or fabrication, call your nearby Carpenter representative. He will be glad to roll up his sleeves and work right along with you. And he can give you a copy of the Carpenter "Notebook on Machining Stainless Steels". It is a shop guide that contains over 90 pages of useful information on turning, milling, drilling, broaching, etc. For your copy, send us a note on your company letterhead, indicating your title. And for the men in your plant, additional "Notebooks" are available at 50¢ apiece.

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STAINLESS STEELS

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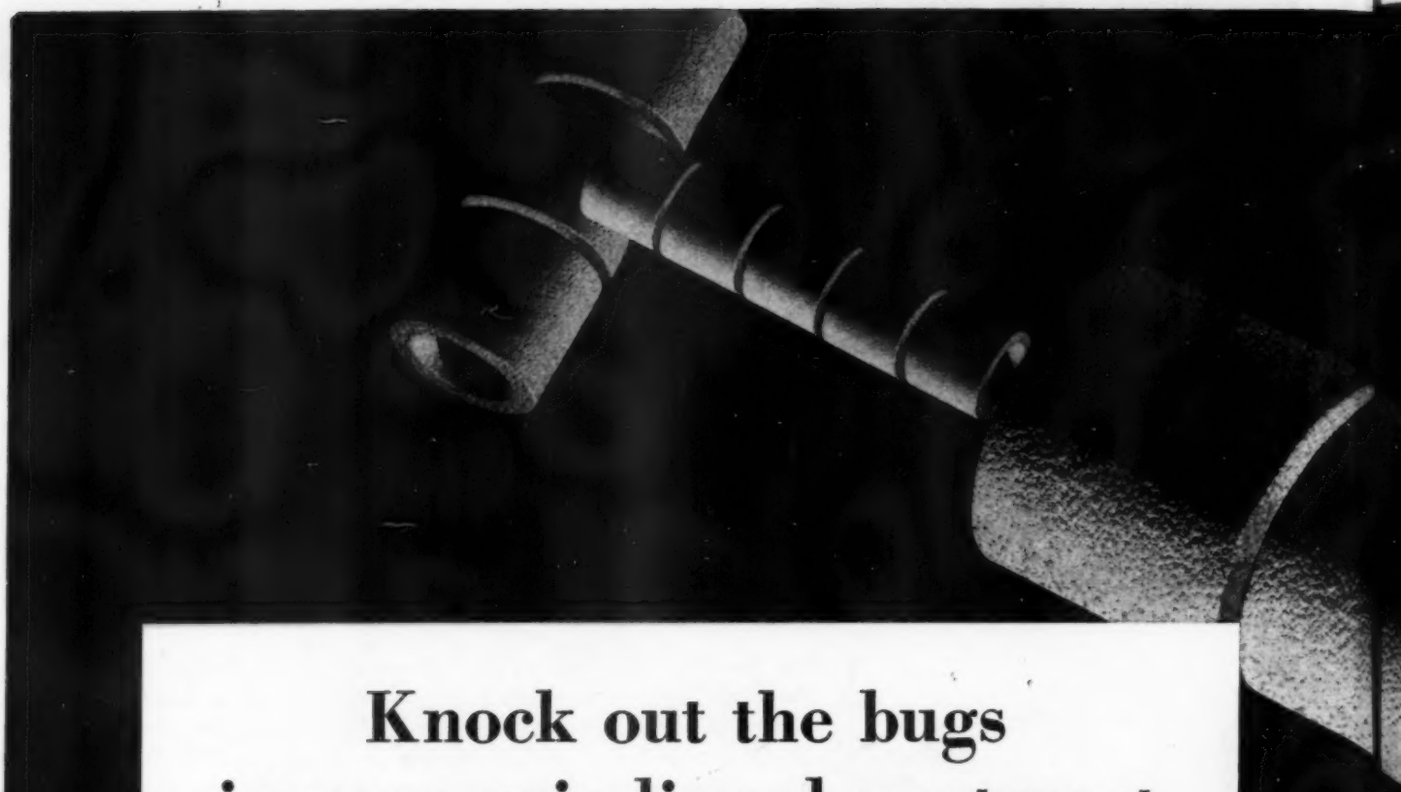


Knock out the bugs in your grinding department

Bugs in your grinding department?

There may be—even though you don't suspect it!

Here's how to find out: call in Peninsular Engineers, specialists in grinding problems since 1889. They will study your grinding completely—your equipment, material to be ground, and all other factors that influence grinding costs.

Results learned will enable Peninsular to propose remedies to knock out any excess-cost grinding practices you now have. Whether your grinding operation is up-to-date or moth-eaten, chances are the Peninsular analysis will save you dollars.

Peninsular Engineers have been cutting production expenses substantially for 58 years right in your own industry.

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

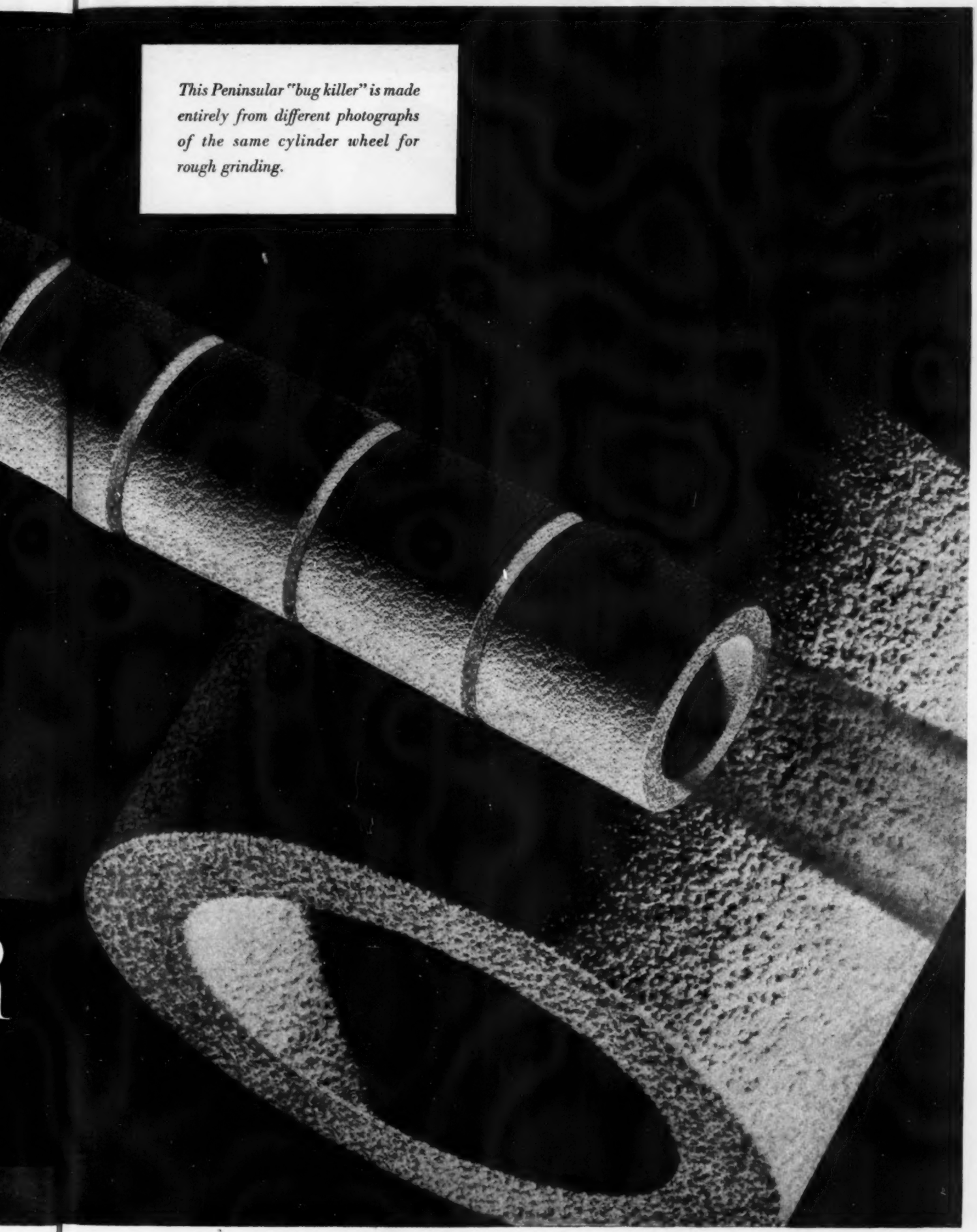
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID & VITRIFIED BONDED WHEELS



This Peninsular "bug killer" is made entirely from different photographs of the same cylinder wheel for rough grinding.

All these PLUS

1. **Improved Draw-In Collet** — increased distance between front and rear collet bearings reduces the protracted error.

2. **Hardened Steel Bed Ways** — top surface and bevel ways for double alignment provide maximum bearing area.

3. **Efficient Speed Lever** — one lever, convenient for operator, selects spindle speed and actuates automatic brake.

4. **Self-Aligning Slide Rest** — mounting shoe automatically aligns slide rest with line-of-center.

5. **Replaceable Spindle Vee Belts** — smooth running, endless vee belts can be replaced without removing lathe spindle.

6. **Vibrationless Drive** — dynamically balanced drive assembly is isolated from lathe mounting.

RIVETT

RIVETT LATHE & GRINDER, Inc.

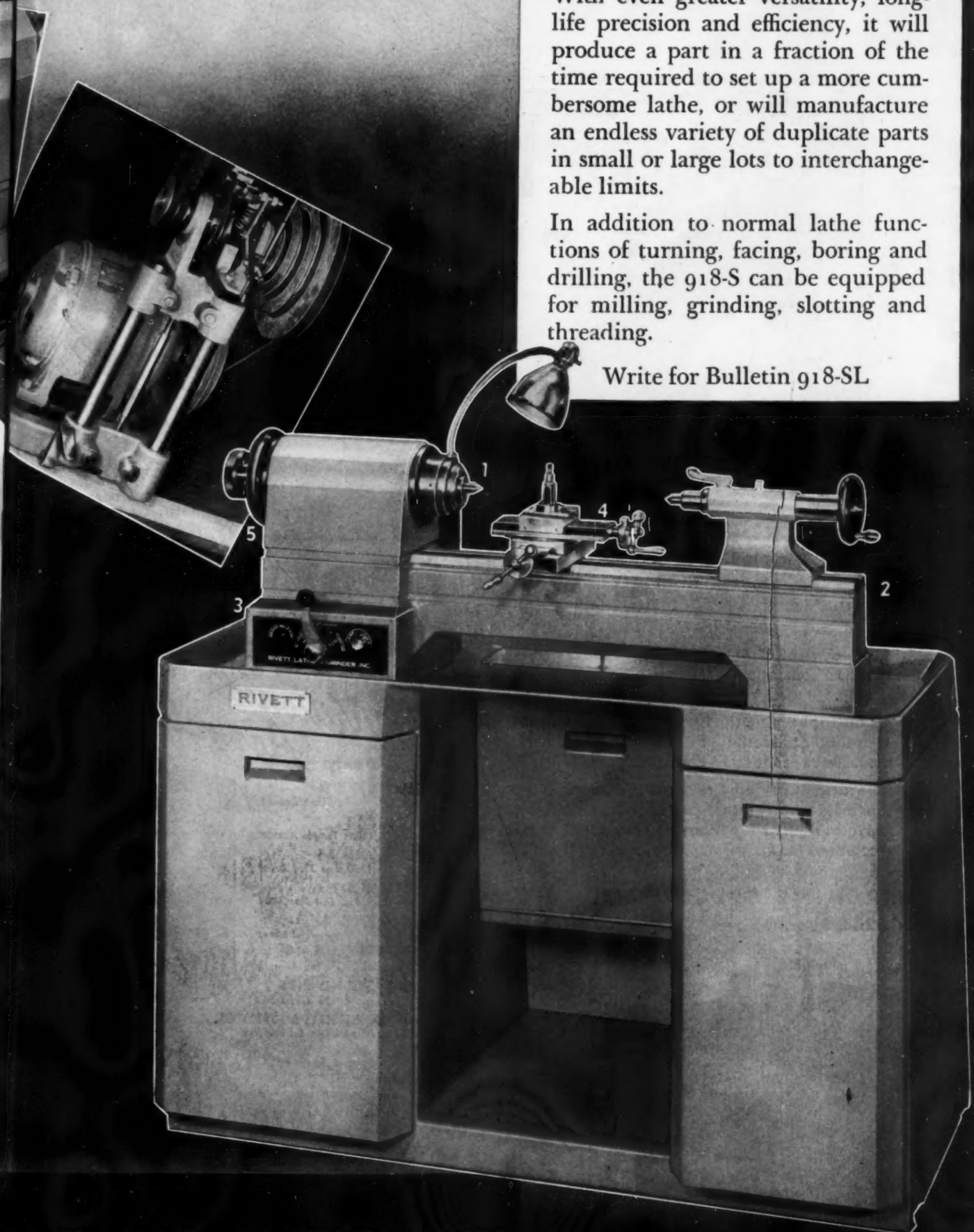
S FEATURES

THE *New* RIVETT 918-S PRECISION CABINET LATHE

With even greater versatility, long-life precision and efficiency, it will produce a part in a fraction of the time required to set up a more cumbersome lathe, or will manufacture an endless variety of duplicate parts in small or large lots to interchangeable limits.

In addition to normal lathe functions of turning, facing, boring and drilling, the 918-S can be equipped for milling, grinding, slotting and threading.

Write for Bulletin 918-SL



BRIGHTON 35 • BOSTON • MASS.

PRESS PRODUCTION

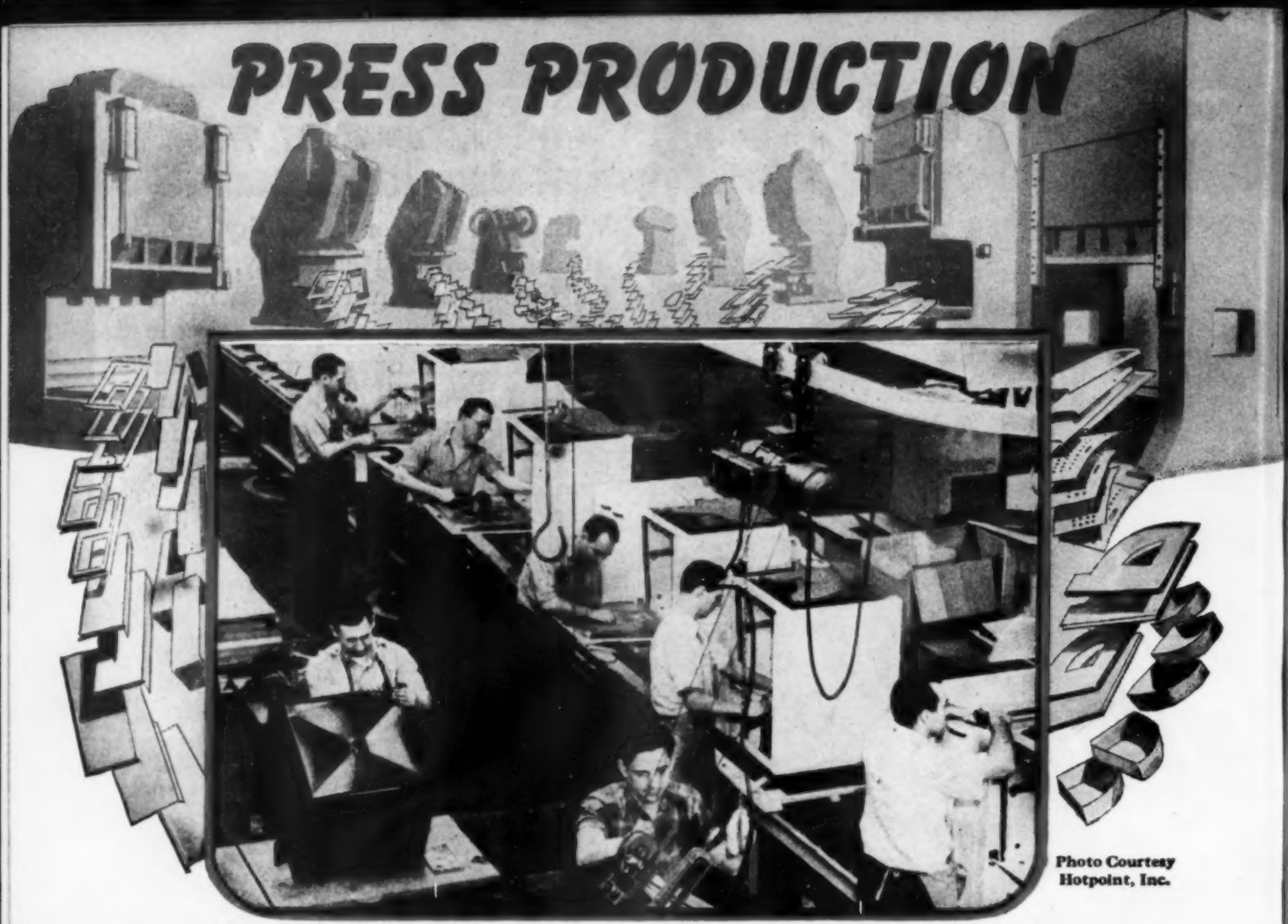


Photo Courtesy
Hotpoint, Inc.

FEEDS THE ASSEMBLY LINE

The Assembly Line—symbol of American Mass Production—depends on a rapid and constant flow of finished parts to each stage of the assembly.

Largely responsible for keeping the line moving, Presses provide the fast, all-around production of duplicated metal parts that modern standards of production demand.

Danly Die Sets—a *necessary part of good Presswork everywhere*—speed die making programs, protect costly dies, cut down time for regrinds. Danly Die Sets and Die Makers' Supplies are nationally recognized for *known dependable accuracy.*

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

DANLY
National Assembly

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- **DETROIT 16**
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- **ROCHESTER 4**
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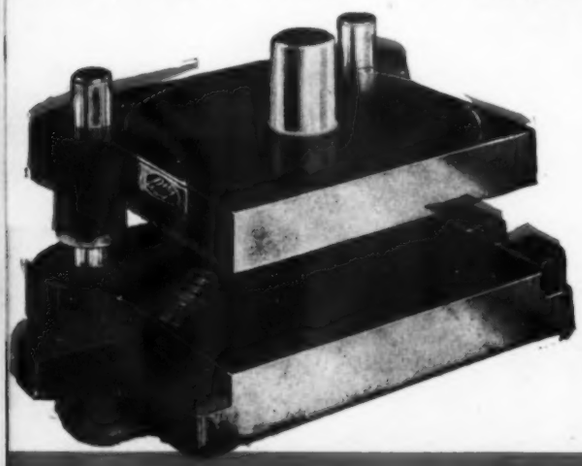
- **PHILADELPHIA 44**
  18 W. Chelten Avenue
- **LONG ISLAND CITY 1**
  47-28 37th Street
- **DUCOMMUN METALS & SUPPLY CO.**
  4890 South Alameda, Los Angeles

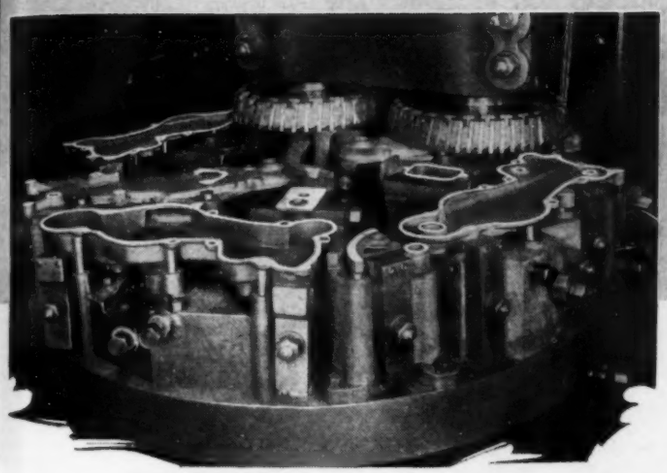


DIE MAKERS' SUPPLIES

DANLY DIE SETS

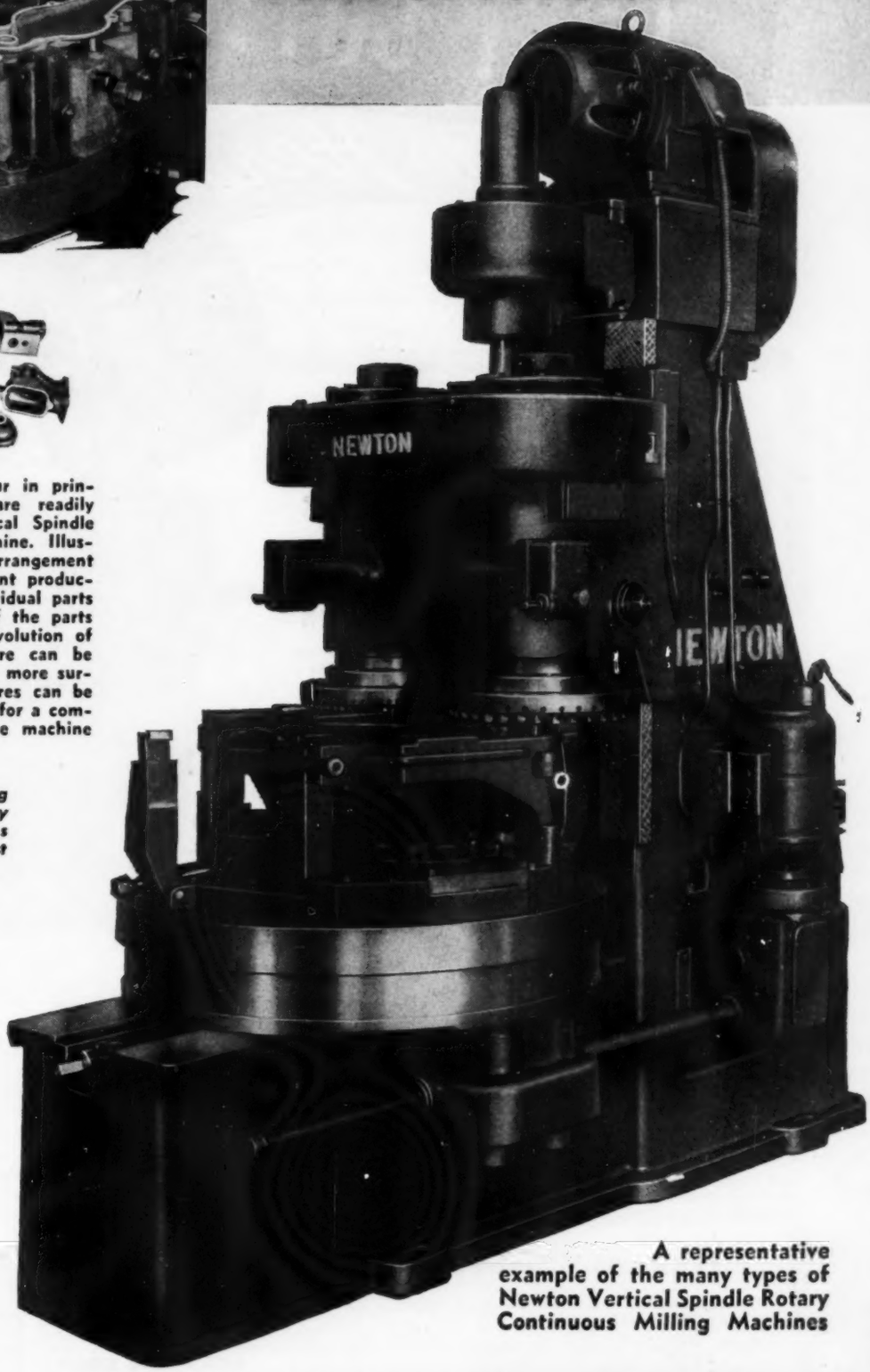
Welded Steel Fabrication

Let one machine with one operator do the work of several



Work-piece arrangements, similar in principle to that shown above, are readily handled on any Newton Vertical Spindle Rotary Continuous Milling Machine. Illustrated here is a fixture arrangement especially adapted to smaller plant production where the quantity of individual parts to be finished is limited. All of the parts shown can be milled at one revolution of the table. Similarly, the fixture can be arranged to accommodate two or more surfaces of the same piece. Fixtures can be arranged to mill all parts needed for a complete assembly, thus keeping the machine in continuous production.

Complete information covering Newton Vertical Spindle Rotary Continuous Milling Machines ill be furnished upon request



A representative example of the many types of Newton Vertical Spindle Rotary Continuous Milling Machines

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
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AUTOMOTIVE TOOLS AND OTHER SPECIAL MACHINES

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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CONSOLIDATED MACHINE TOOLS

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MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

PRESS PRODUCTION

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DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

DANLY
National Assembly

Call Danly

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  18 W. Chelton Avenue
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- **DUCOMMUN METALS & SUPPLY CO.**
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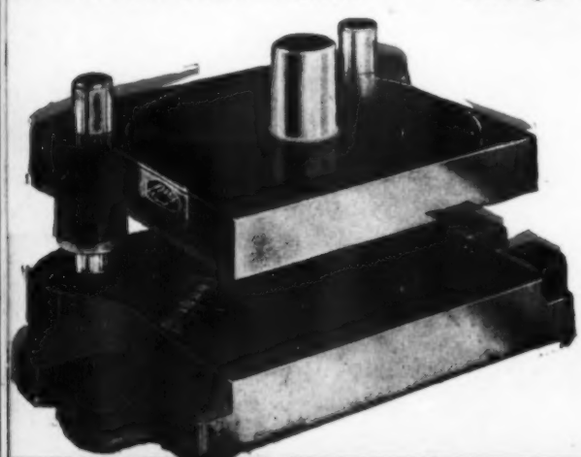
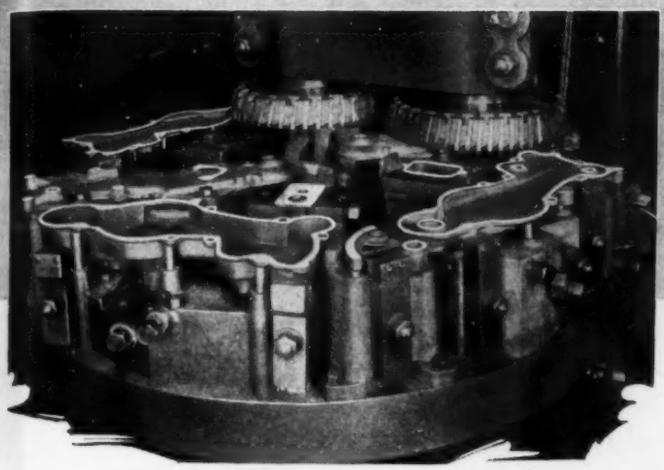


DIE MAKERS' SUPPLIES

DANLY DIE SETS

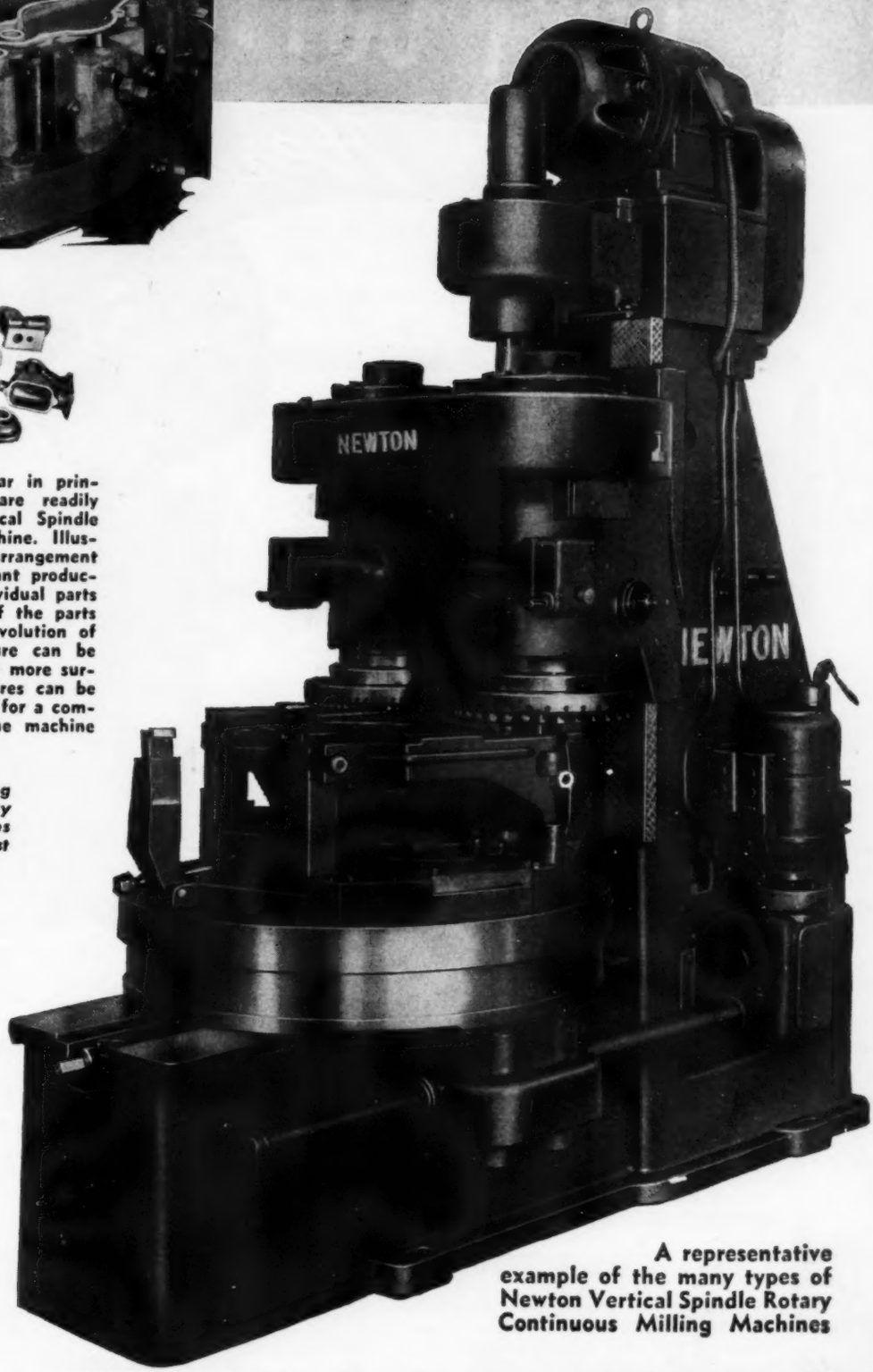
Welded Steel Fabrication

Let one machine with one operator do the work of several



Work-piece arrangements, similar in principle to that shown above, are readily handled on any Newton Vertical Spindle Rotary Continuous Milling Machine. Illustrated here is a fixture arrangement especially adapted to smaller plant production where the quantity of individual parts to be finished is limited. All of the parts shown can be milled at one revolution of the table. Similarly, the fixture can be arranged to accommodate two or more surfaces of the same piece. Fixtures can be arranged to mill all parts needed for a complete assembly, thus keeping the machine in continuous production.

Complete information covering Newton Vertical Spindle Rotary Continuous Milling Machines will be furnished upon request



A representative example of the many types of Newton Vertical Spindle Rotary Continuous Milling Machines

Among Heavy Machine Tools built by Consolidated are . . . .

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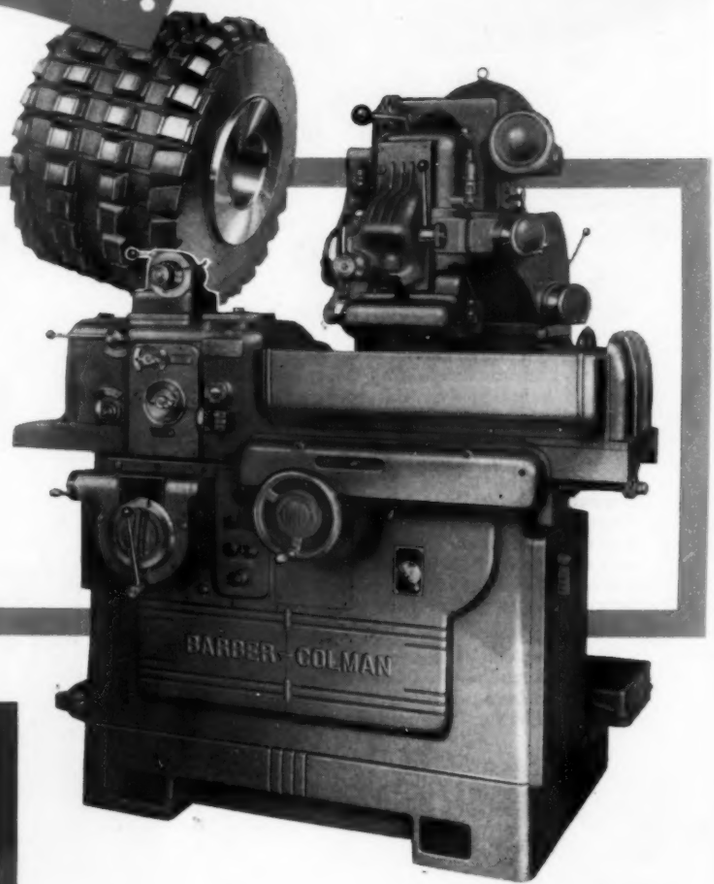
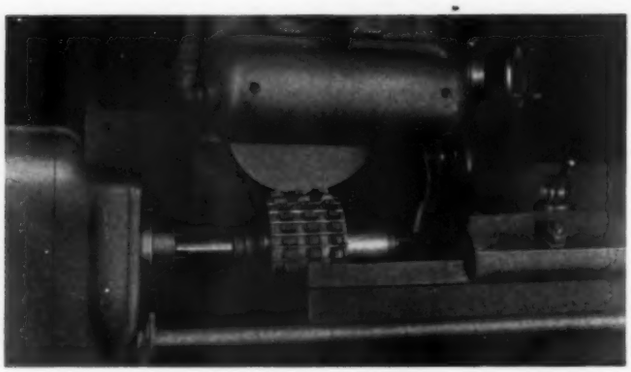
COST CUTTING *Begins Here...*

NEW BARBER-COLMAN NO. 6-5 HOB SHARPENING MACHINE PROVIDES EASIER, MORE ACCURATE FACE SHARPENING THROUGH PRECISION CONTROLS AND HYDRAULIC OPERATION.





EXACTING SHARPENING PROBLEM EASILY SOLVED

Class AA Sharpening Maintained To Meet Production Standards.

Stock Removal Varies Due To Taper Root Hob Design.

Machine Construction and Controls Eliminate Usual Inaccuracies Due to Unequal Grinding Wheel Pressure and Deflection.

PRODUCTION RECORD

Operation—Face Sharpen Taper Root Spline Hobs to Class AA Limits

Hobs—5" Dia. x 3½" Face, 26 Gashes

Cutting Faces—Radial

Wheel—7" Carborundum, 3600 RPM

Feed Per Rev.—.0005"

Coolant—Micro-Grind

Accuracy—Adjacent Spacing—.0005"
Non-Adjacent Spacing—.001"
Radial Faces—.0003"

WRITE for complete story on performance and design of this *new* machine. Ask for Bulletin F3213.

EASIER, MORE ACCURATE BARBER B-C COLMAN **HOB SHARPENING**

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST. ROCKFORD, ILLINOIS U.S.A.

Apply the advantages of WESTINGHOUSE SPEED REDUCERS

... to your drive applications

When you select a unit to reduce prime mover speed, be sure to get the plus features offered in Westinghouse Speed Reducers.

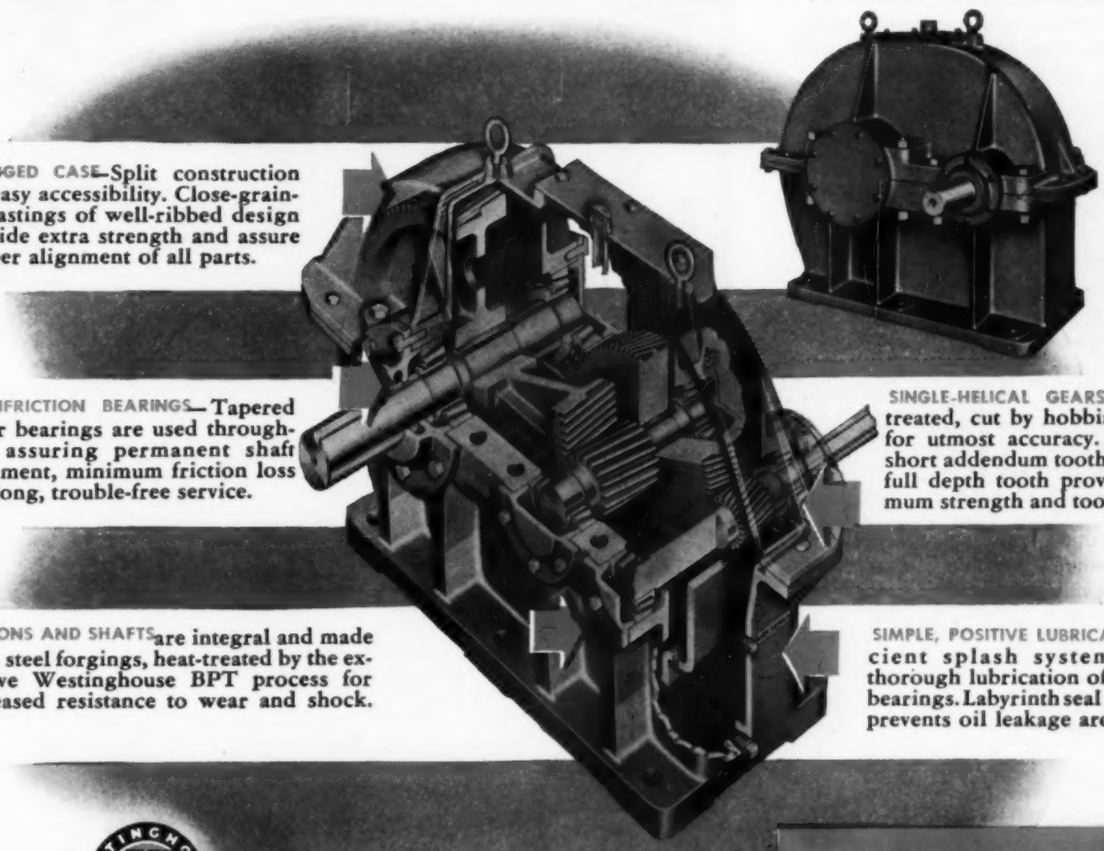
High operating efficiency and long service life are assured by Westinghouse design, precision manufacturing methods and selection of materials used in construction.

Exact speed reduction requirements may usually be obtained from the 24 standard sizes, for drives up to 500 hp, with choice of 28 ratios from 2.82 to 70.5.

Get in touch with your nearest Westinghouse office for assistance on the application of Westinghouse Speed Reducers to your own drives. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-07260

★ ★ ★

Type SH speed reducer—a single-reduction unit furnished in 13 standard ratios in each of 12 sizes. Type DH speed reducer (cutaway view, below) is a double-reduction unit, offered in 15 standard ratios in each of 12 sizes. Power transmission efficiency of Type SH averages 98%. Type DH averages 96%.



RUGGED CASE—Split construction for easy accessibility. Close-grained castings of well-ribbed design provide extra strength and assure proper alignment of all parts.

ANTIFRICTION BEARINGS—Tapered roller bearings are used throughout, assuring permanent shaft alignment, minimum friction loss and long, trouble-free service.

SINGLE-HELICAL GEARS are heat-treated, cut by hobbing process for utmost accuracy. Long and short addendum tooth form with full depth tooth provides maximum strength and tooth overlap.

PINIONS AND SHAFTS are integral and made from steel forgings, heat-treated by the exclusive Westinghouse BPT process for increased resistance to wear and shock.

SIMPLE, POSITIVE LUBRICATION—Efficient splash system assures thorough lubrication of gears and bearings. Labyrinth seal in end caps prevents oil leakage around shaft.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

4 OUT OF 5 DRIVES need speed reduction

Westinghouse Industrial Geared Drives are fully described and illustrated in Booklet B-3730. Write for your copy.

NEW 1" BAR MACHINE

★ Rugged CONE box frame with short upright members for dependable support to all mechanism, work and tools — high speed steel or carbide.

2 Generous chip and coolant reservoir space in big base, with large chip disposal ports and relief valve control of coolant volume.

★ Famous CONE overhead, chip free, smooth, powerful tool-drive, cam system.

4 Fifty work spindle speeds in a two range helical gear transmission, 220 to 4700 RPM.

★ Heavily ribbed, single unit, three bearing, adjustable, CONE spindle carrier.

6 Pre-loaded, anti-friction bearing, balanced work spindles, with hardened and ground bearing surfaces, ball thrust bearings, and helical drive gears positioned to effectively distribute the working load.

★ Flexible power feed transmission with a selectivity of approximately 225 tool feed combinations between 24 and 1100 work revolutions.

8 Large, open, freely accessible, tooling area.

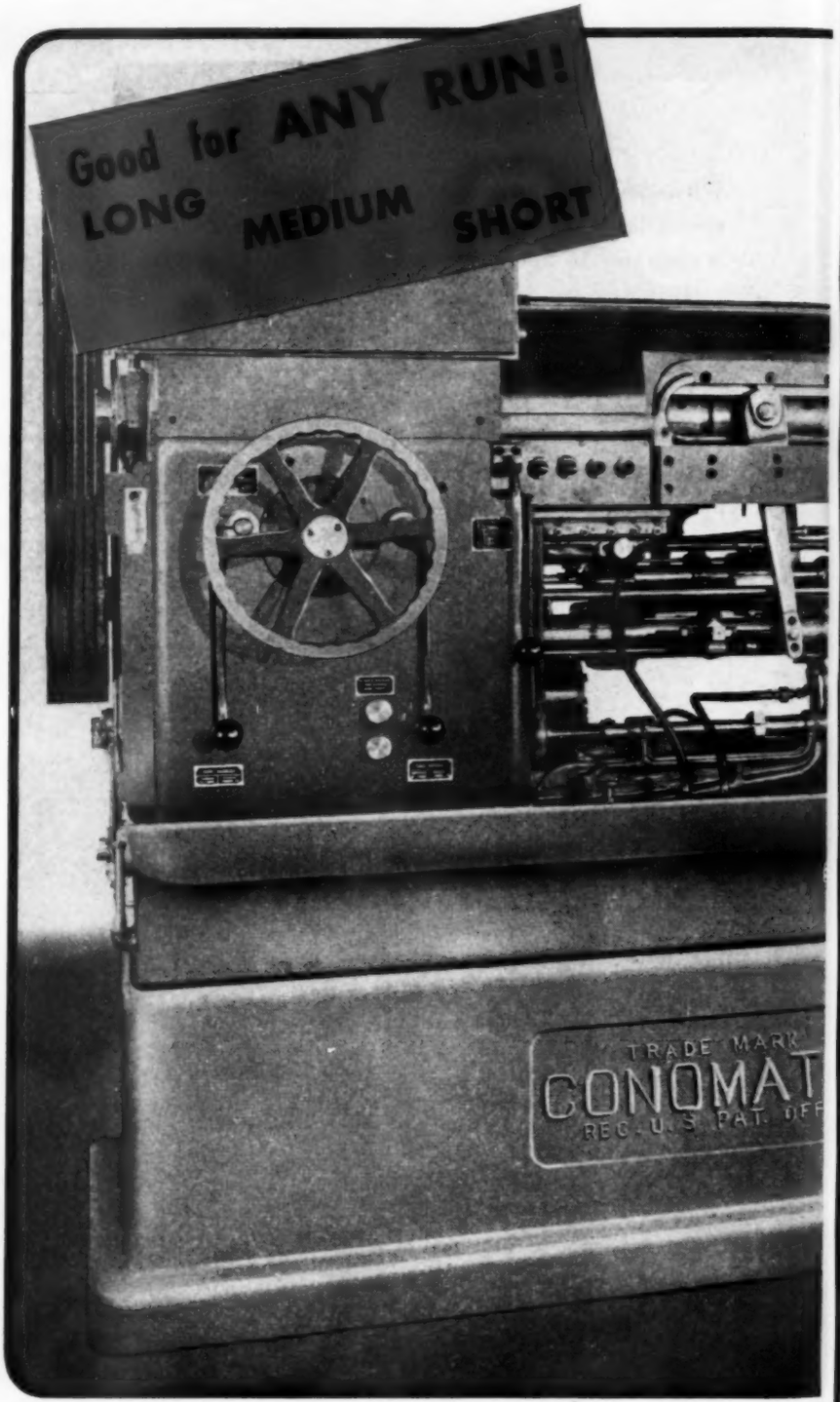
★ Six, standard machine equipment, rigid, liberal bearing, CONE cross slides, with independent, dial controlled change of working stroke, with complete form tool holder interchangeability, and profile blade, dovetail and circular types of form tool accommodation, and with calibrated form tool holder adjustment.

10 CONE chip free, selective, block measurement, positive stop system for accurate forming cut control.

★ Variable idle time control for more effective machine application.

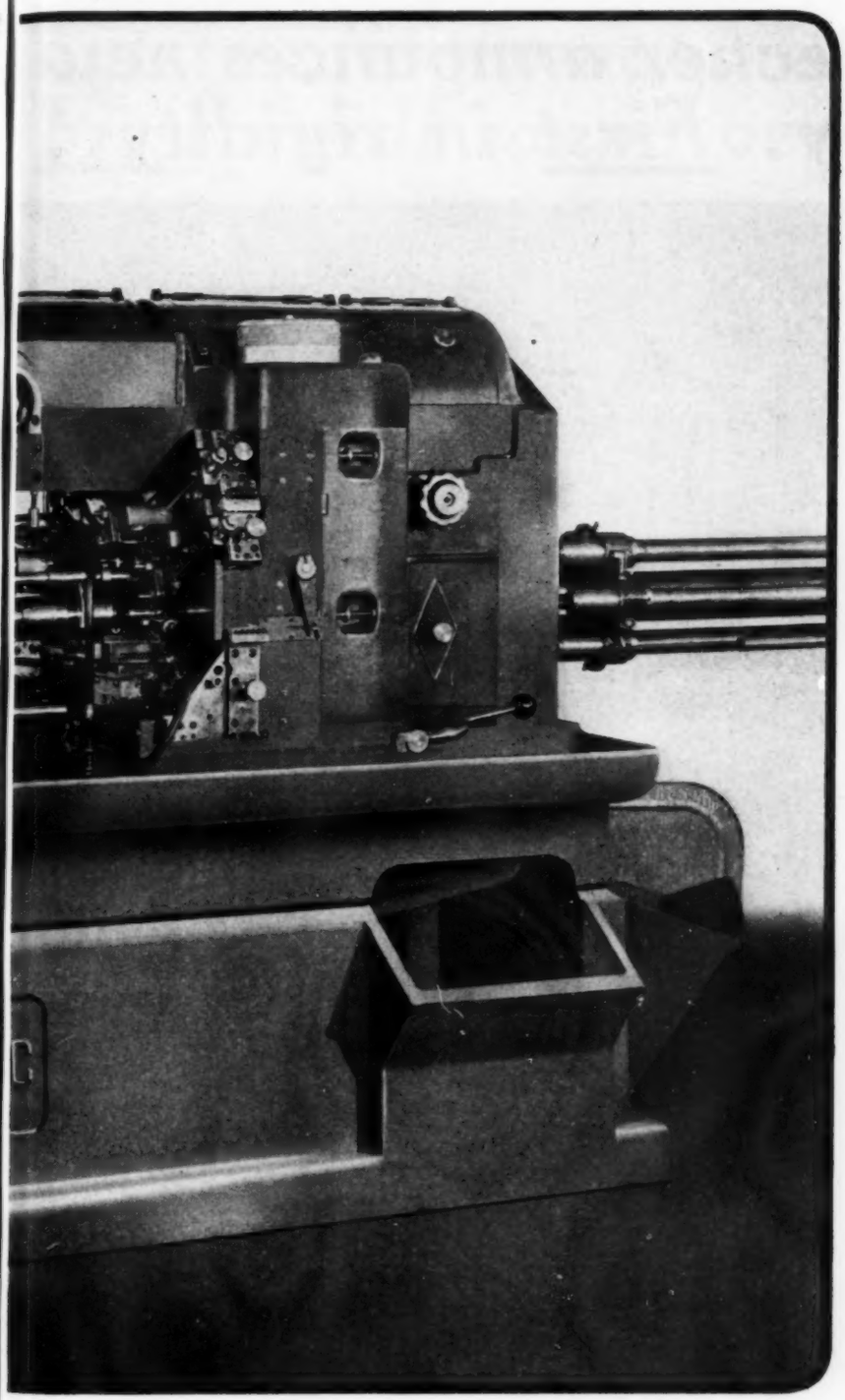
12 Fully enclosed, fast operating, durable, finger holder units.

13 Combination forced feed and gravity flow lubricating system with filter and visible flow indicator, with grease fittings for slower moving parts.



COMPARE ITS ★ TWELVE

6-SPINDLE CONOMATIC



14 CONE power reverse for all toolslides to hasten tool up and lessen operator fatigue.

15 All controls — mechanical and electrical — accessible to operator from both sides of the machine.

16 Long, accurately aligned, cylinder shaped, main endworking toolslide, with six full endworking positions accurately located from work spindle axes, with sufficient clearance to swing standard make die-heads to thread work to full machine collet capacity, with dial controlled change of working stroke.

17 Machine cycle indicator for observing progress of machine through its production cycle.

18 CONE quick-change attachment drive, with open-end attachment gear application, to independently drive attachments in any, or all main toolslide positions, with dial control of independent working travel.

19 Quickly positioned, fine adjustment, swing type stock-stop; entire unit removable for special work.

20 Provision for mounting two auxiliary cross slides on milled sections of topbed.

21 Smooth, shockless, dependably accurate, harmonic, spindle carrier indexing.

22 Dial controlled stock-feed length adjustment.

23 Fast pusher tube change without moving stock reel.

24 Time saving electrical controls that bring free running spindles to dead stop, and prevent machine stopping before its cycle is completed should abnormal overload develop.

25 Sound deadened stock reel tubes standard equipment.

26 Master type collets and pushers for fast change-over standard equipment.

26 FEATURES EXCLUSIVELY CONE

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AUTOMATIC MACHINE CO., Inc.

WINDSOR, VERMONT, U. S. A.

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Kearney & Trecker announces new in accuracy . . First in rigidity . .

1 MILLING MACHINES AT THEIR BEST— DESIGNED TO PUSH COST CURVES DOWN

Here it is — a new Kearney & Trecker — Milwaukee Series of Simplex Bed-Type Milling Machines

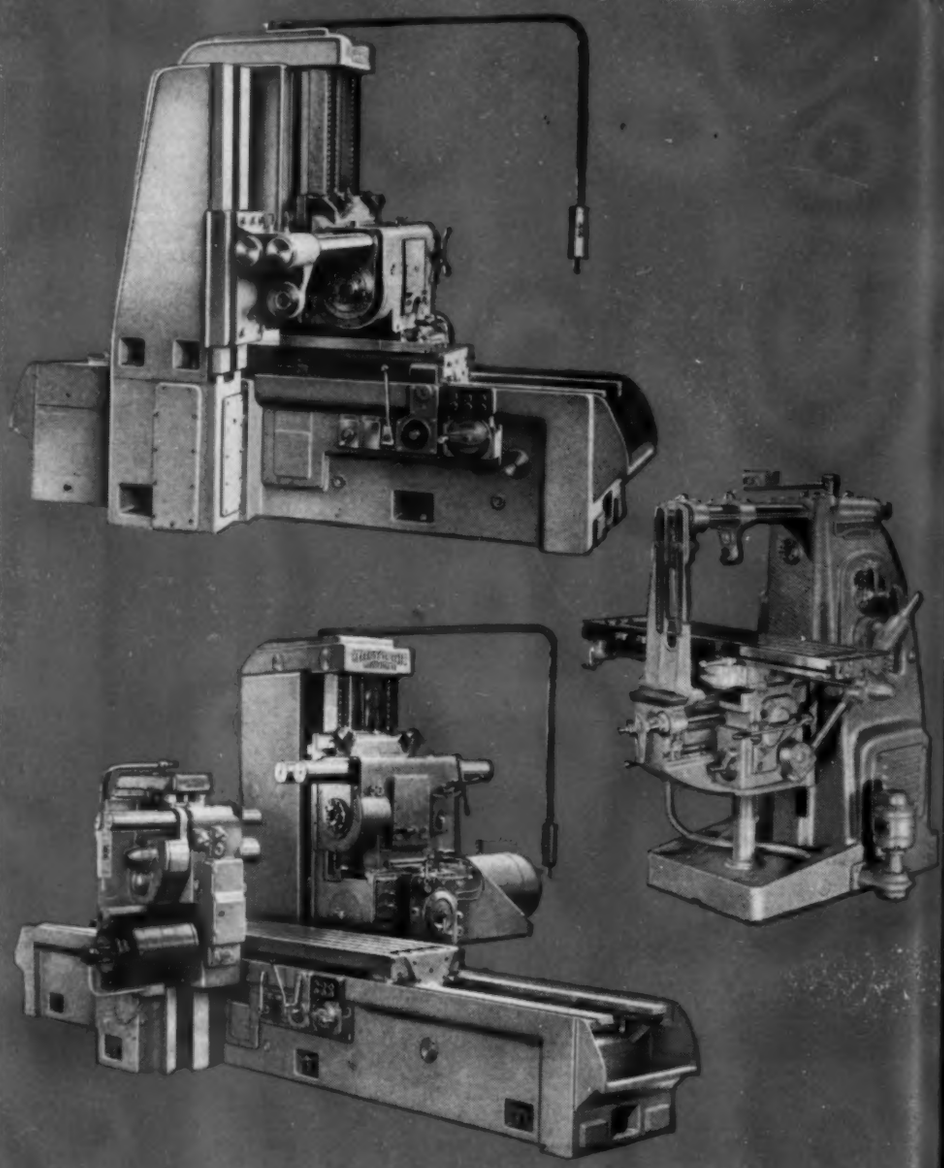
These machines bring you a completely new design with a combination of exceptionally wide working ranges and horsepower capacities for most effective use of modern cutting tools. For high production with fine precision—there's no better design on the market.

The new Kearney & Trecker — Milwaukee Model E simplified milling machine

"E" stands for Efficiency, Ease of operation and Economy. This machine incorporates every fundamental requirement for either foreign or domestic use. Its modern design plus economy of parts offers you the highest dollar for dollar value in efficiency obtainable anywhere.

Think of it! A series of Duplex Bed-Type Milling Machines offering 48 different working ranges and horsepower combinations!

Machines that offer custom-built possibilities for your work at standard machine costs to you. Truly an entirely new concept in bed-type design — they use all modern cutting tools to maximum effectiveness. They give you high production, 1948 style.



KEARNEY &

CORPORATION

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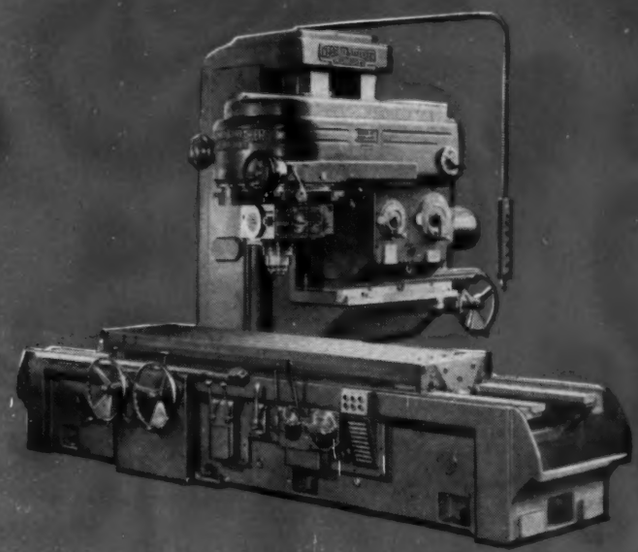
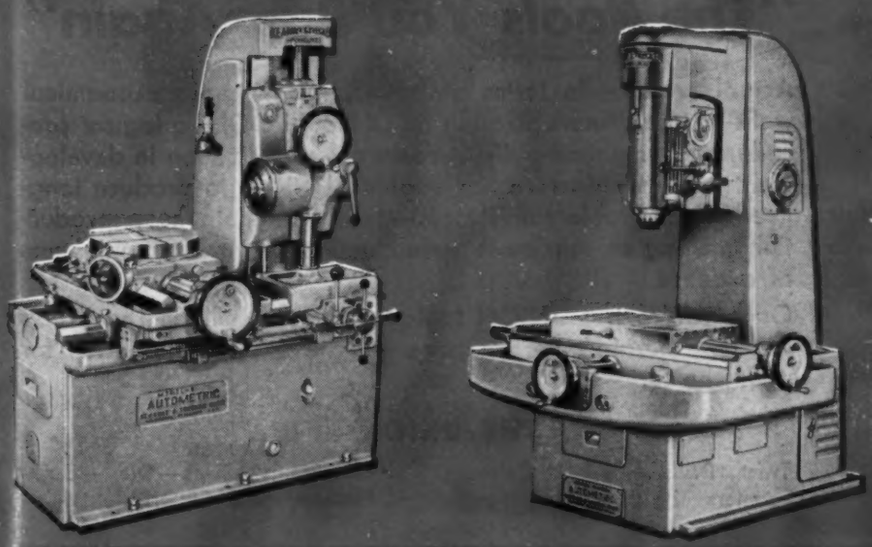
outstanding machine tools . . . First First in all-round performance!



World's most advanced milling machine

The new Model 5D combines bed-type machine working range with revolutionary Kearney & Trecker Rotary-Head Principle of Milling. Mills any geometric shape, in horizontal or vertical planes, directly from blue print, without models or templets. For versatility of application, it leaves nothing to be desired. If you make dies for drop forging, die castings, plastic parts or molds for permanent mold castings, you cannot afford *not* to investigate this machine.

2 BORING MACHINES AT THEIR BEST— DESIGNED TO PUSH PRECISION CURVES UP



America's finest precision boring machines

The Model B Autometric (left) for horizontal work and the Model C Autometric (right) for vertical work. Each machine is the direct result of nearly a half-century of experience and several years of intensive research in design and manufacture of precision machine tools. Every refinement, of a practical nature, that can be used in performing highly accurate work has been incorporated in these machines. You will be amazed at the three-dimensional accuracy in the performance of these precision tools.

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KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

A-481

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Actual results — in terms of better, faster, more economical work—make standardization on UNION TOOLS a logical procedure and a sound policy. Years of specialization in development and manufacture has enabled UNION to produce long-lived, dependable small tools — tools that help keep production moving at maximum speed and accuracy at a minimum of expense.

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THE UNION LINE

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION

The problems involved in grinding holes in the end of a shaft often make production men lead a dog's life. Now, with the Bryant No. 112-M these problems are solved quickly and accurately. This machine is designed to finish bores up to 9 inches deep in the end of parts such as machine tool spindles, arbors, shafts, etc. The work table is arranged so that parts may be held either in the hollow work spindle and steadyrest or in a special fixture so that a spindle can be ground on its own bearings. The workhead and steadyrest have longitudinal adjustment and can be swung for grinding standard tapers (Brown & Sharpe, MMS, Morse, Jarno, etc.) up to 30° included angle. Reverse tapers up to 10° included angle can be ground.

The wheelhead can be either belt driven (standard) or direct drive for high wheel speeds.

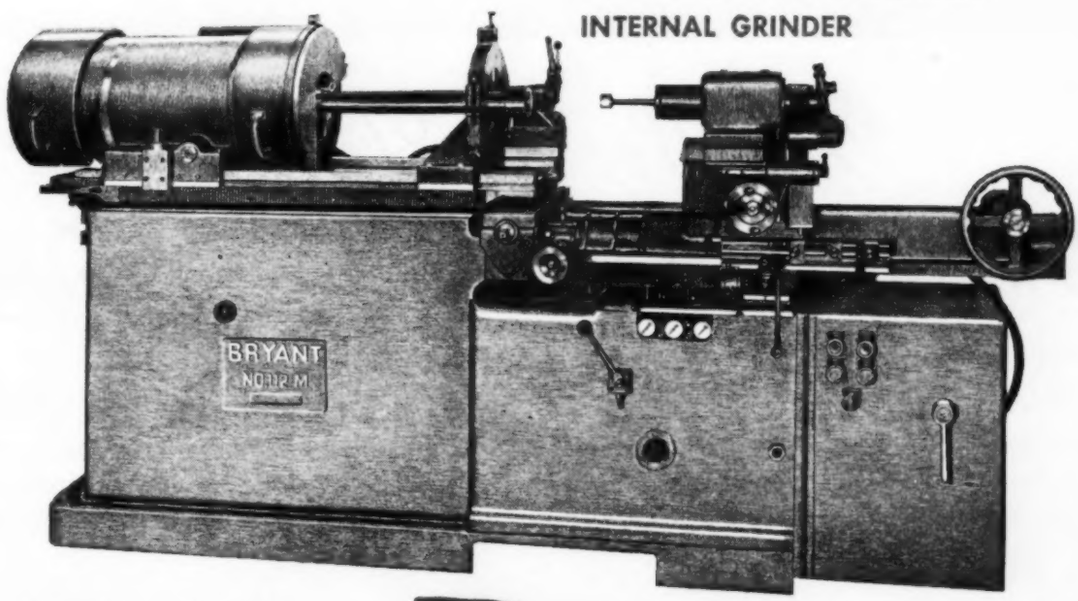
To facilitate loading and gaging, the wheelhead moves 8" to the rear. This same roller bearing slide provides cross-feed for sizing. The workhead (with 16" diameter swing) and the wheelhead are precision ball bearing construction. The axial wheelhead slide is a hardened steel bar riding on pressure lubricated bearings.

The controls include: variable speed in workhead by hydraulic motor 100 to 1,000 r.p.m.; variable rate for work and truing traverse; power cross-feed with variable rate; calibrated depth stop for facing operations; quick set reversing dogs to control position and length of wheelhead traverse.

An extra workhead is available to index 180°. This is to assure concentricity of bore at the ends of a shaft.

Write for the new Bryant No. 112-M catalog sheet which gives complete details.

NO. **112-M** HYDRAULIC
INTERNAL GRINDER



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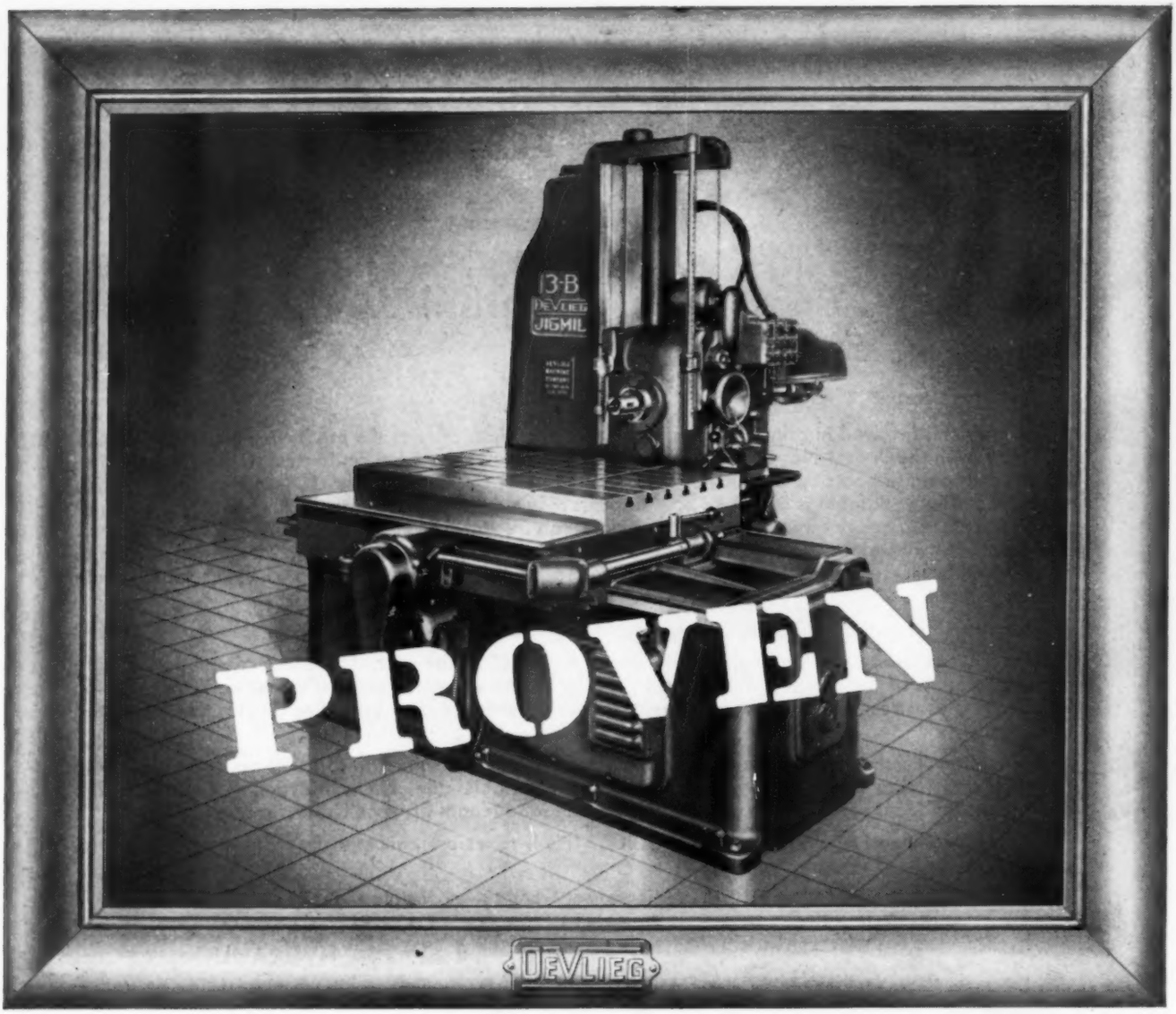

The World's Finest Boring and Milling Machine

THIS model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten thousandths part of an inch) Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL Idea is a totally new approach to the problems of precision boring at a new low cost.

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for Kellering AT ITS FASTEST AND BEST

A NEW ERA in fast tracer-controlled milling was inaugurated at Accuracy Headquarters in Chicago with the introduction of the new Type BG-22 Keller Machine by Pratt & Whitney.

Now, large Kellering jobs can be done faster, more accurately and more conveniently than ever before in Kellering history. This entirely new machine introduces many new and unusual advantages of design and control.

For example this new machine is ideal for large automotive dies produced from masters. The unique all-electric control together with greatly increased speed and built-in convenience can shorten setup time by many hours . . . production time by several days. The new BG-22 Keller can give a big time advantage when the pressure is on for new production tooling.

Call your P&W Engineer or write today for complete details.

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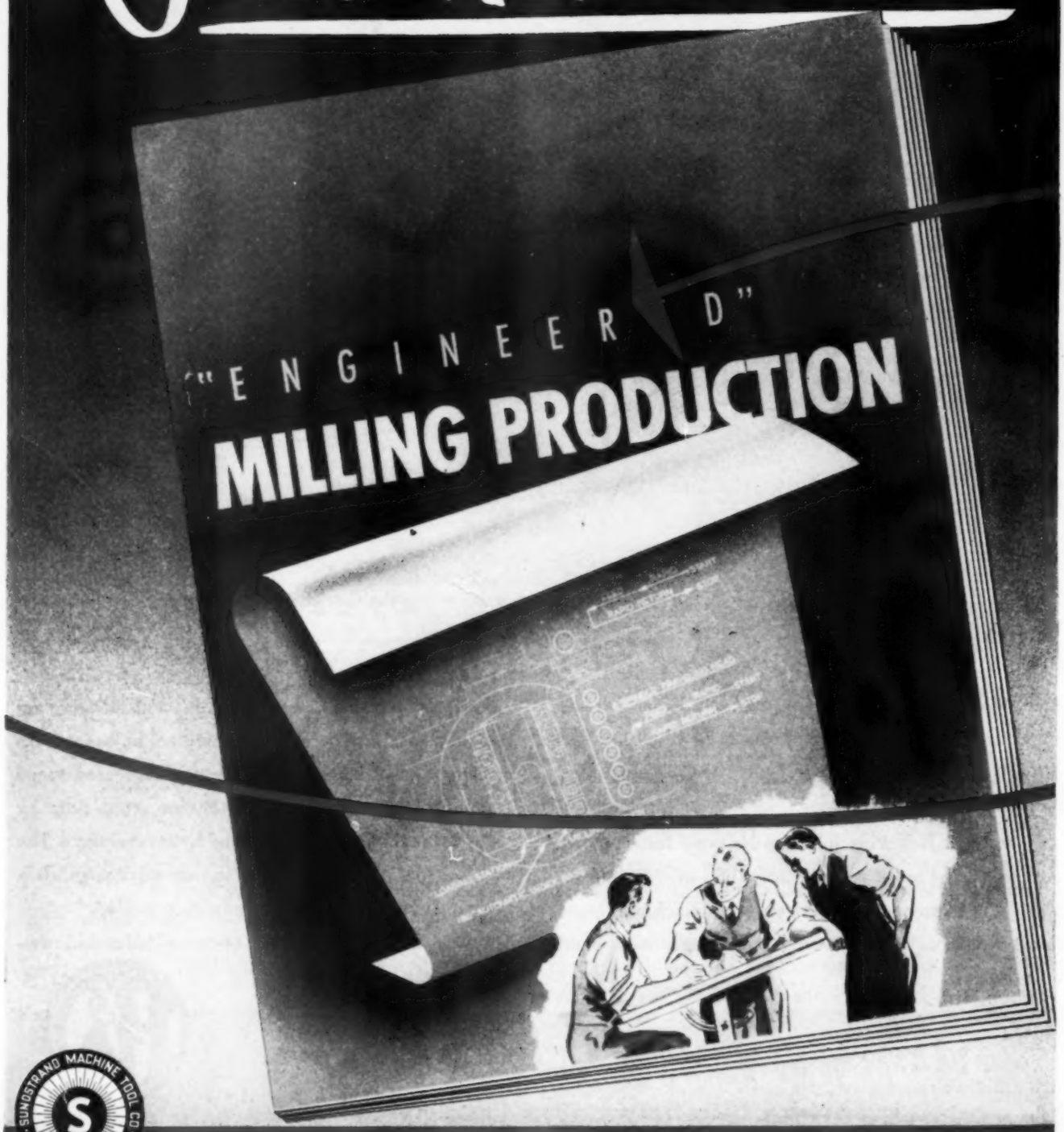
Just Released!

"ENGINEERED"

MILLING PRODUCTION



SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

The Newest Sundstrand Guide to Profitable Production Milling!

Here's another new helpful milling production data book. You'll find the same kind of helpful ideas in this book that you found in our book entitled "Practical Milling Methods." In fact, this is really book number 2 of "Practical Milling Methods." For instance, it contains:

40 Pages of Helpful Production Milling Information

This 40 page booklet reveals how most production milling problems can be solved most economically by one or a combination of only three different methods. It offers a new, direct and simple approach to solving production milling problems *profitably* . . . includes applications of milling in all types of metal working plants, all metals. You'll get some fresh ideas from this book . . . ideas you can use now or later. It contains:

Over 35 Actual Problem Solutions and Tooling Diagrams

Not theory, but actual, practical milling production methods are analyzed in this new book. Included are over 35 specific applications of standard, modified standard and entirely special machines with the actual milling production methods revealed in tooling diagrams. Each example illustrates the most practical solution to one specific problem.

Each is the result of a Sundstrand "Engineered Production" study—a procedure which determines the most practical milling method first, then the most practical machine design to suit this method.

How to Use this Factual Information to Simplify Your Milling Production

You'll probably find jobs similar to yours among the many diversified milling problem solutions illustrated in this book. Checking your jobs with the simple, effective methods offered will help you determine the most profitable solution to the job at hand.

Here are a few of the Milling Jobs Included in This Helpful Book

These are but a few of the interesting milling jobs illustrated and described in this new book:

- Straddle milling lugs on clutch plates
- Automatic index milling of 6 blind end grooves
- Duplex milling 4 sides of a compressor block
- Milling 11 surfaces on exhaust manifold
- Milling internal slot in an outboard motor part
- Milling 6 oil grooves in 2500 piston rings per hour
- Milling 2 slots and radius in 1200 pistons per hour

WRITE TODAY FOR *Free* 40-PAGE MILLING BOOK!

Check your jobs with the simple milling production methods described in this new outstanding book. It's free, write on your company letterhead, ask for book No. 154.

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TOOL HOLDERS

answer both . . .

1. The problem of lowering costs

2. The problem of increasing output

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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new

Use SAME BLADES and SAME LOCKS for all sizes of cutters

The GAIRING

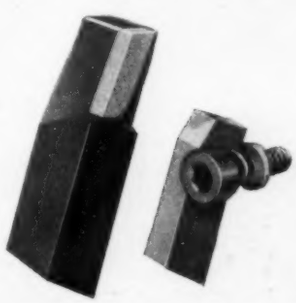
E-CON-O-MILL

Pat. applied for

A New Carbide Face Mill Made in Standard Sizes 5-inch Diameter and over

CUT DOWN YOUR TOOL INVENTORY

REDUCE DOWN-TIME OF YOUR MACHINES



Rigid tests under actual production have confirmed careful laboratory tests; this entirely new milling cutter has true one-piece rigidity under severe working conditions. Yet with all parts quickly and easily interchangeable, inventory costs and machine down-time are cut to an all-time low. Cutter bodies give full support to the entire projection of the blade, not only behind but also underneath.

The same blades are used for all sizes of cutter bodies. They are furnished diamond-ground to a gage, ready for work. They are made in three types, for cutting steel, for cast iron, and for non-ferrous materials. The assembled cutter need not be placed on a cutter grinder. The blades may be re-ground individually on an ordinary wet carbide grinder. When the cutter is set up in the machine, blades may be lined up against the cut in the work.

The same locks are used for all sizes of cutters. They are in one piece and remain attached to the cutter body when changing blades.

Write for illustrated folder which gives complete data and prices.

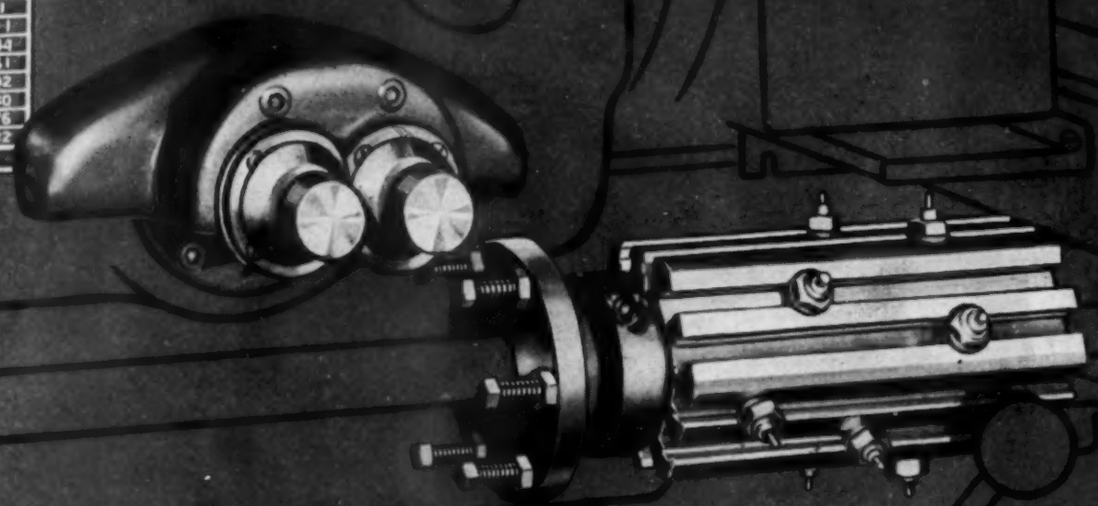
THE GAIRING TOOL COMPANY
21226 Hoover Road
Detroit, Michigan

GISHOLT FASTERMATICS

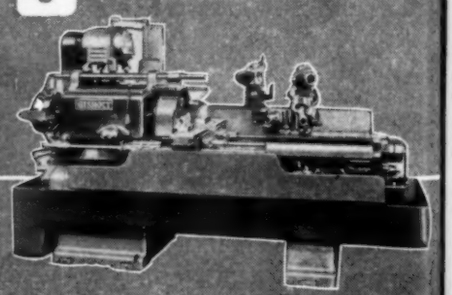
(AUTOMATIC TURRET LATHES)

CHANGE GEARS NO. TEETH UPPER	LOWER	SPINDLE SPEEDS VALVE DIAL POSITIONS NO.183	NO.184	NO.283
25	65	22	40	74
29	61	27	50	91
33	57	33	61	111
37	53	40	73	134
41	49	48	87	161
45	45	57	105	192
49	41	68	125	230
53	37	81	150	276
57	33	96	181	332

DRIVE SHAFT SPEED 1040 R.P.M.



These simple controls provide automatic (or manual) selection of speeds--to save time --cut machining costs



THE FASTERMATICS—Speed changes are effected at buttons in spool contact hydraulic control knobs. Changes may be made automatically at any point during hexagon turret's travel, or manually for convenience of set-up. Various ranges of spindle speeds are available.

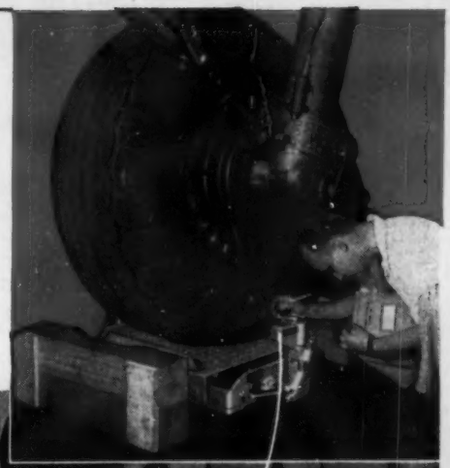
GISHOLT MACHINE COMPANY, *Madison 3, Wisconsin*

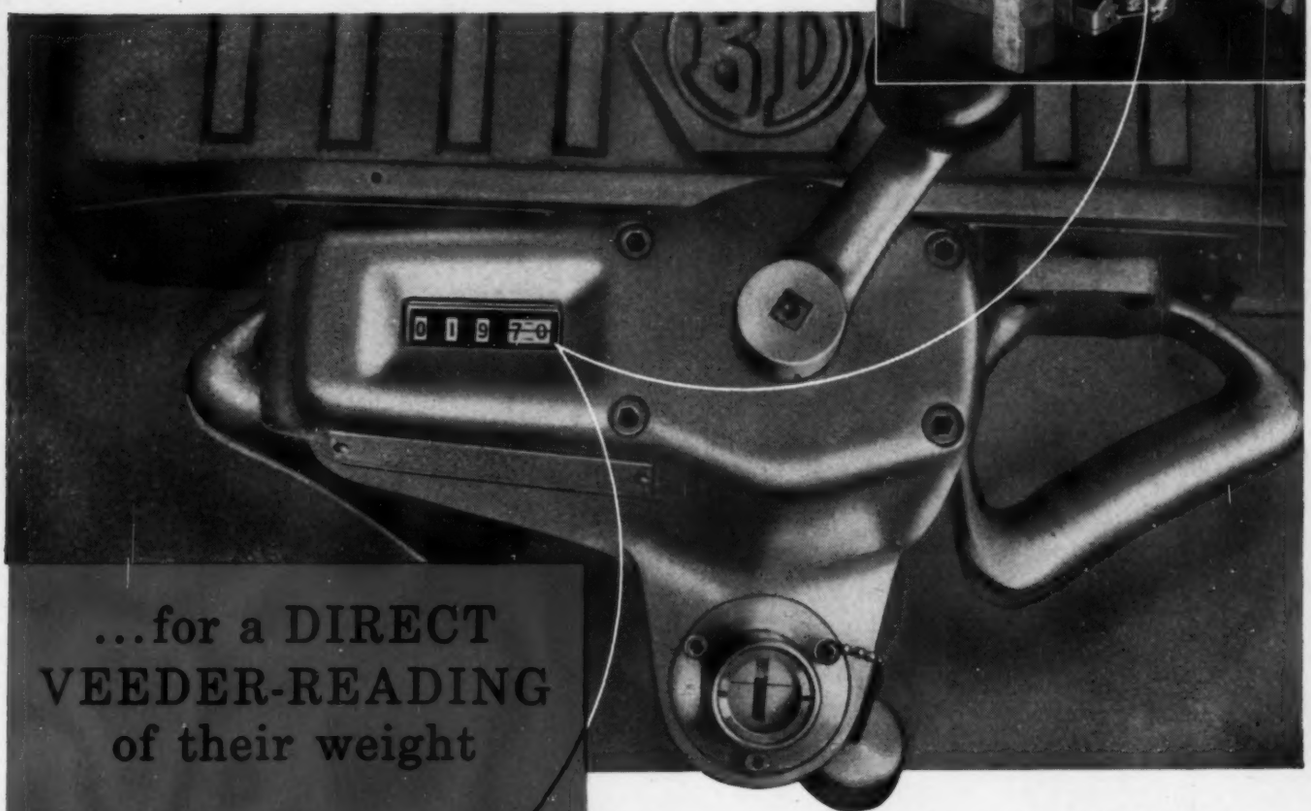
THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.

turret lathes · automatic lathes · superfinishers · balancers · special machines

Now... Aircraft "Step Right Onto the Scales"...





...for a DIRECT VEEDER-READING of their weight

VEEDER-ROOT RESET COUNTER, built into the Aircraft Loadometer made by The Black & Decker Mfg. Co., Towson, Md.

To determine the weight and balance of any aircraft . . . tiny flying boat or giant transport . . . *here's all there is to do:*

Run each plane wheel up the ramp and onto the platform of the convenient portable Aircraft Loadometer. As simply as that, this accurate Black & Decker device gives an instant reading of the plane's weight.

In the Loadometer, the system of weighing levers is pivoted to a calibrated spring. This spring is extended by a micrometer screw geared to a Veeder-Root Reset Counter which gives an instant and *direct* Veeder-Reading of the plane's weight in pounds or kilograms.

In selecting a counting device for the Aircraft Loadometer, Black & Decker chose this Veeder-Root Reset Counter because it provides a *positive* reading, because the reading *remains* after the load is removed from the platform, and because the device is easily *reset* to balance at zero after each weighing. The Veeder-Root counter also provides an accurate minimum reading of five pounds and upward to the maximum capacity of 20,000 pounds.

Here again is proof that Veeder-Root not only "Counts Everything on Earth"—but also many things that fly above it. And standard or special Veeder-Root Devices, built into *your* product, can count to your advantage in more ways than you could ever figure out, alone. So talk it over with a Counting House engineer. Just write and say when you want him to call.

VEEDER-ROOT INC.

HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3.
In England: Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.

Here it is...

THE MOST ADVANCED DEVELOPMENT

UNIQUE! NEW!

AUTOMATIC PINION TURNING MACHINE

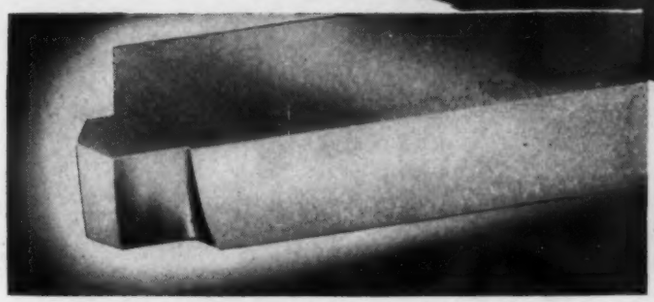
- Exclusive design
- 8-tool turret
- Circular-formed tool blades
- Positive micrometer tool stops
- Up to 4:1 ratio of cam lobe rise to longitudinal feed
- Single-point turning
- Turret axis parallel to work-axis
- Rigid work support

Now . . . with this new Brown & Sharpe Machine . . . consistent accuracy in staff and pinion turning is made practically automatic. Uniformly rapid automatic movements, regardless of time required to make a part, are insured by a constant speed drive shaft. Change gears provide rates of production from 3 to 364 seconds for one piece per cycle. 16 spindle speeds, from 10,000 to 910 r.p.m. Takes stock to ¼" diameter and turns up to 2⅞" length.

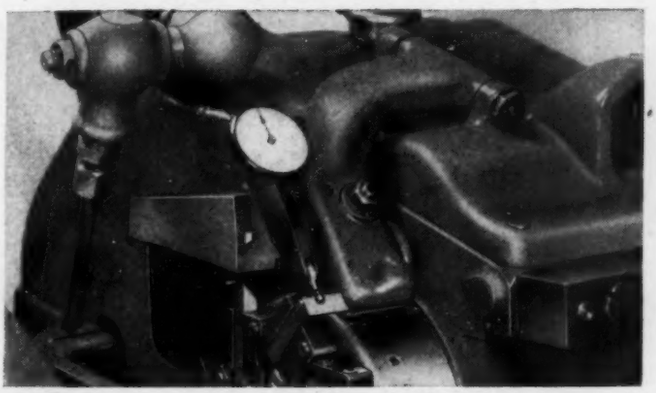
BROWN &

IN MACHINES FOR PINION and STAFF WORK

New Brown & Sharpe Automatic Pinion Turning Machine introduces new simplicity of set-up duplication . . . new, consistent accuracy of operation.



CIRCULAR-FORMED SINGLE-POINT TOOLS, an exclusive Brown & Sharpe development, retain exact original shape after resharpening by full-length surface grinding.



TOOL ADJUSTING DIAL INDICATOR on swing-arm permits accurate replacing of tool. Dial reading of original tool setting is duplicated simply when new tool is inserted.

INDIVIDUAL MICROMETER STOPS for each tool speed up original set-up and simplify accurate duplication when tools are replaced or reground.

A typical indication of the overall advances in design of the new Brown & Sharpe Automatic Pinion Turning Machine is the fact that *accurate operation can be maintained without highly skilled operators!* Accurate duplication of set-ups is made easier than ever before, by improved design . . . exclusive circular-formed single-point tools . . . built-in tool resetting indicator and centering gage . . . and individual micrometer stops for each of the 8 tool positions.

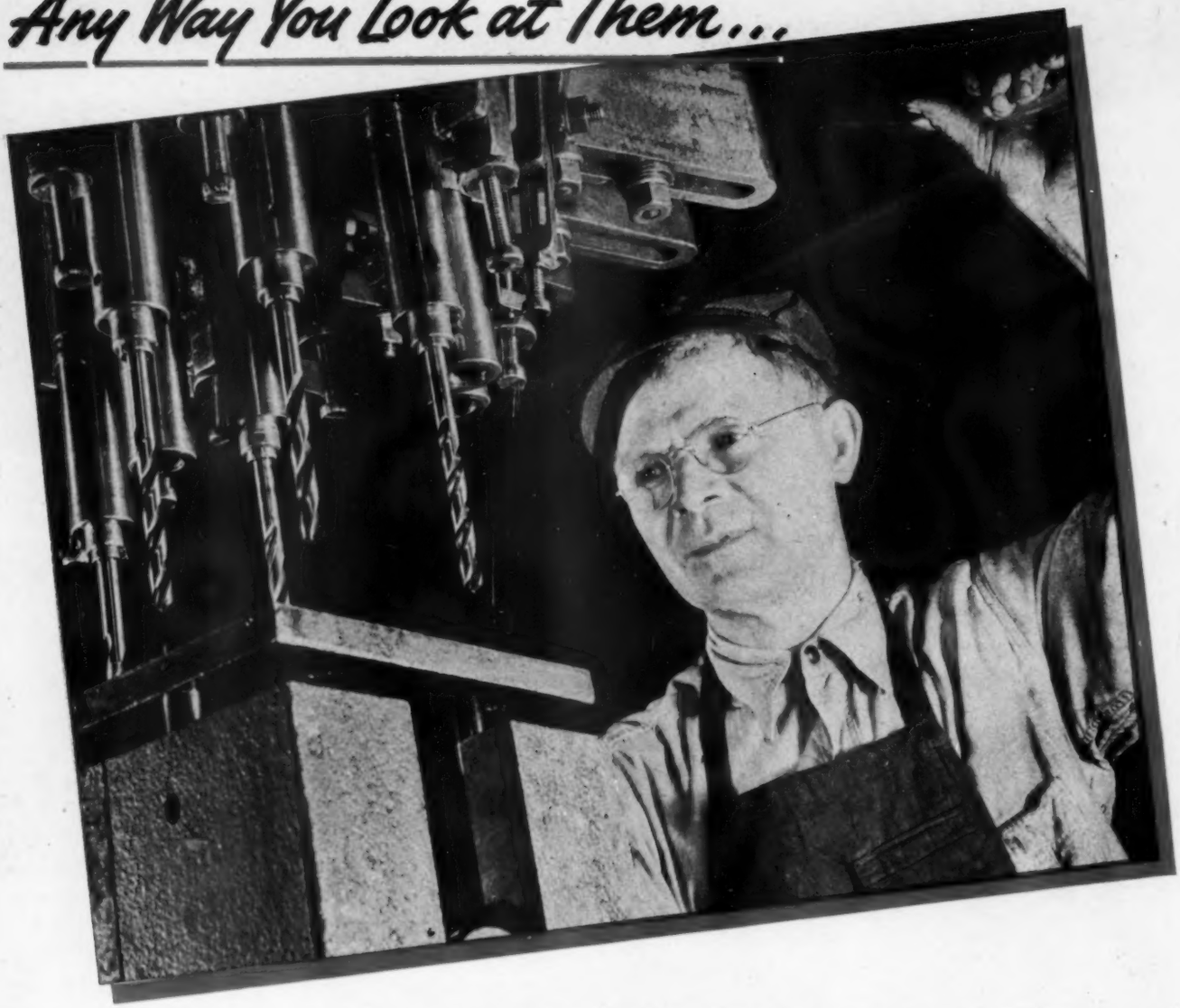
Another typical indication of the advanced design of this machine is its elimination of inherent mechanical sources of inaccuracy. Only 2 cams are employed in the drive mechanism . . . both mounted close together on the same drive shaft to eliminate torque distortion. And as much as 4:1 ratio of cam lobe rise to longitudinal feed further increases accuracy.

These are only a few of many features that contribute to the extraordinary efficiency of the new Brown & Sharpe Pinion Turning Machine for pinion and staff jobs. Write for complete information. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

SHARPE

B·S

Any Way You Look at Them...



CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF.

Give You the MOST for Your MONEY

Hundreds of tests have proven that CLE-FORGE High Speed Drills produce holes *faster* and *at lower cost.* This is the basis on which drills should be selected, for the original cost of a drill does not determine its value. You will find that CLE-FORGE High Speed Drills give you more holes per dollar... and thus actually cost less.

Telephone your I INDUSTRIAL S SUPPLY D DISTRIBUTOR

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND 14

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

70 THOMAS ST., NEW YORK 7 • 2929 EAST GRAND BLVD., DETROIT 2 • 9 NORTH JEFFERSON ST., CHICAGO 6
1902 NORTH FIELD ST., DALLAS 1 • 658 HOWARD ST., SAN FRANCISCO 5 • 2301 EAST 38TH ST., LOS ANGELES 11
B. P. BARBUS, LTD., BRUNEL RD., ACTON, LONDON, W. 3, ENGLAND

Indexing accuracy of new Turmatic gear shaver assured by Timken bearings

IN the new Red Ring Turmatic Gear Shaving Machine, accurate indexing from one station to another is largely dependent upon the bearings on the central column. That's why the manufacturer selected Timken bearings. Timken bearings are also used at other important points of precision including the head and tail stocks, and the main cutter spindle.

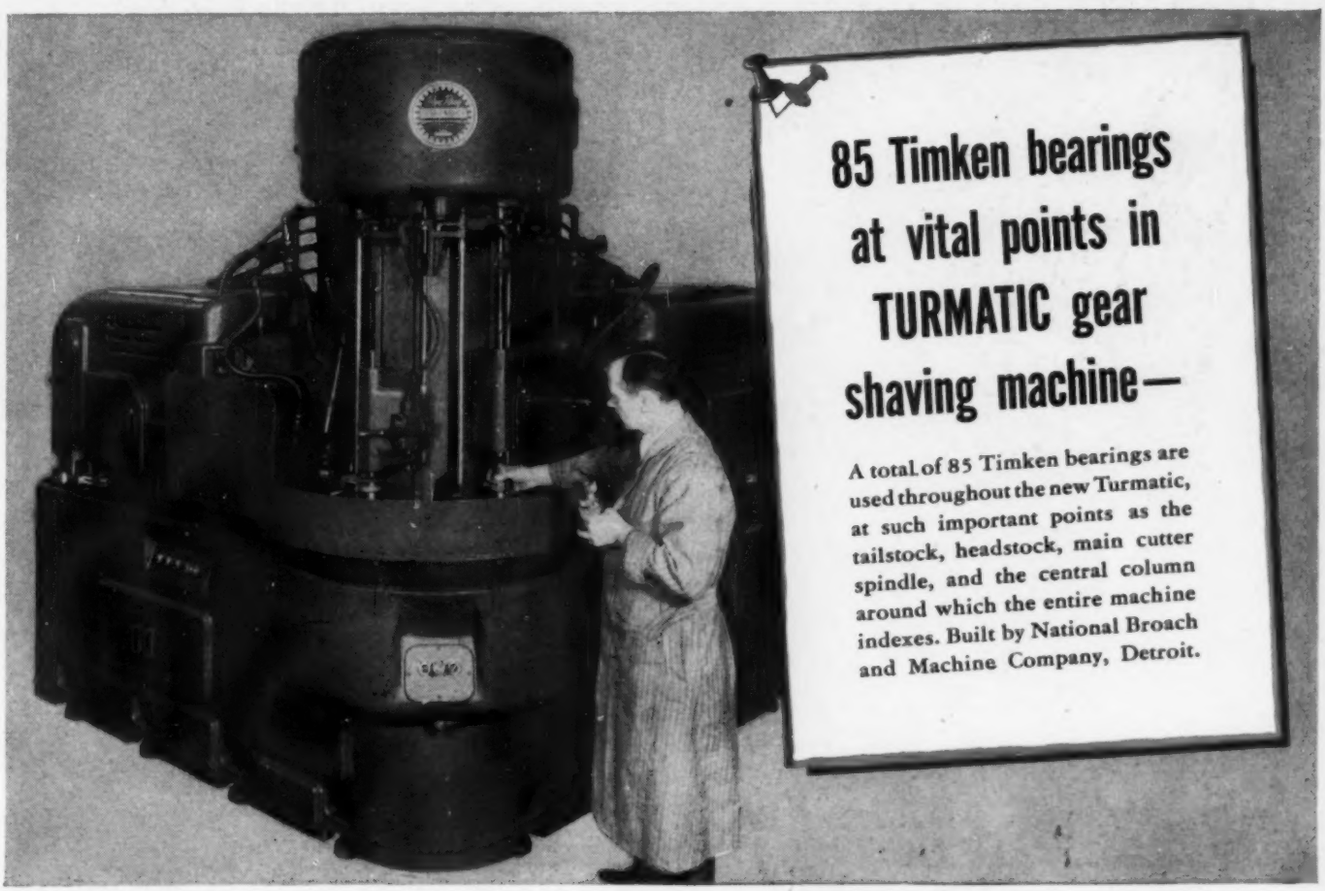
With Timken bearings, shafts are kept in rigid alignment; proper gear contact is assured. Maximum support is provided by the line contact between rolls and races. And because of their tapered construction, Timken bearings carry any combination of radial and thrust loads, distributing the load evenly over the full length of the roller surfaces. They may be taken up in assembly and accurately pre-loaded to any desired degree.

To further assure precision in machine tools, the Timken bearing is a "Generated Unit Assembly" — parts perfectly mated — no need for breaking in or final adjustment on the job. Made of heat-treated Timken fine alloy steel, Timken bearings safely carry the heaviest loads and normally last the life of the machine.

Whatever type of machine tool you buy or build, it can benefit from Timken bearing precision and long life. No other bearing combines *all* the advantages you get with Timken Bearings. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



85 Timken bearings at vital points in TURMATIC gear shaving machine—

A total of 85 Timken bearings are used throughout the new Turmatic, at such important points as the tailstock, headstock, main cutter spindle, and the central column around which the entire machine indexes. Built by National Broach and Machine Company, Detroit.

FINISHED TO CLOSE TOLERANCES

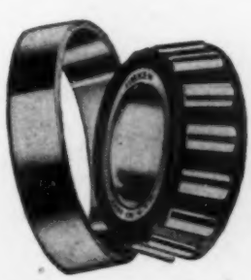
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at Timken.

Timken is the only bearing manufacturer in the country which makes its own steel, and leads in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER — BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION

Brings new flexibility to your Plant

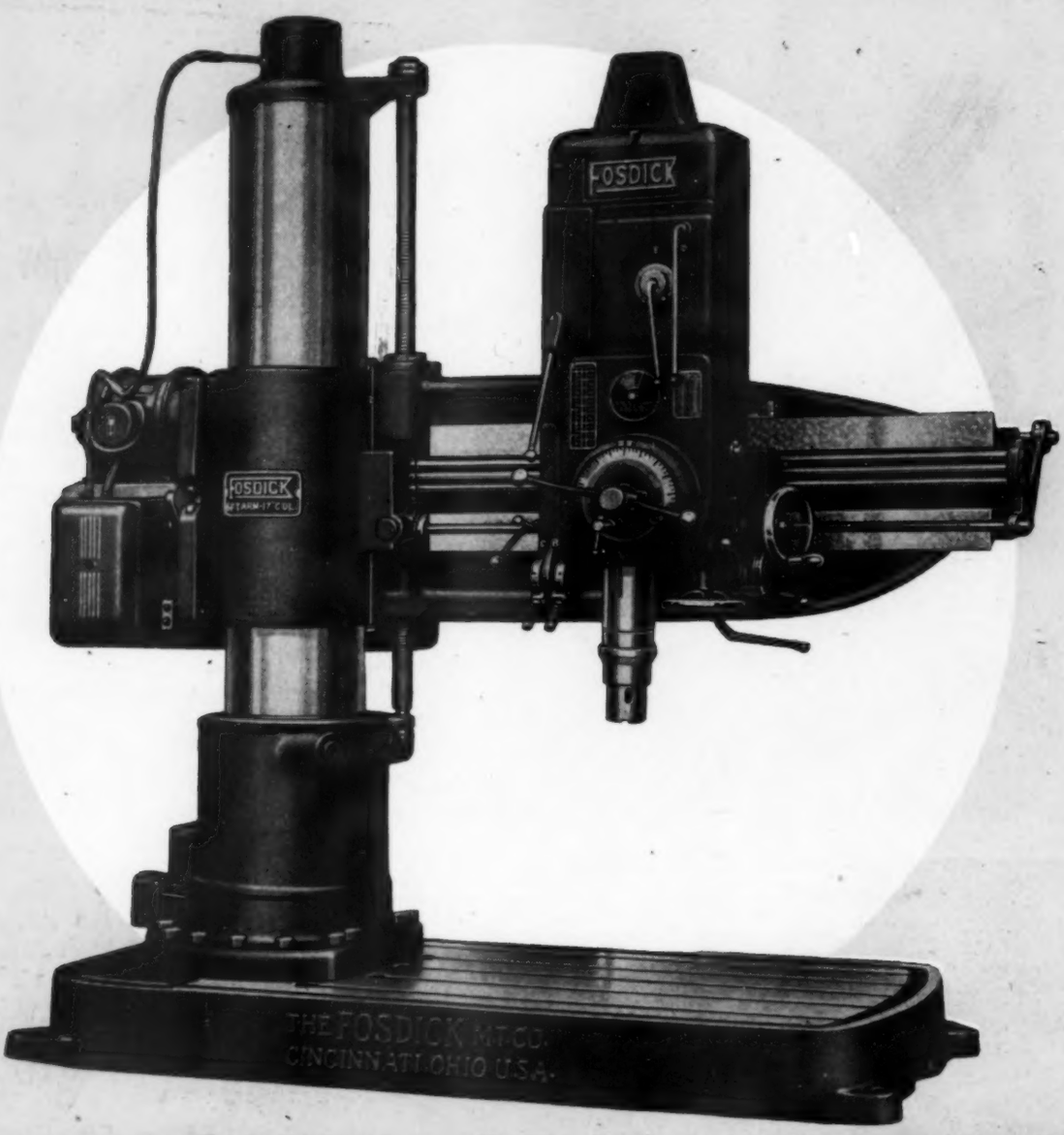
One of the most important exclusive developments in Fosdick Radials is the new hydraulic interlocking mechanism. Fosdick has interlocked the clamping of the head and column with the engaging of the feed mechanism through the spindle feed clutch lever.

When the operator has located the head and arm in proper position for drilling, he engages the spindle feed clutch lever which automatically clamps head to arm and column to stump.

Disengaging the feed clutch lever leaves the arm and column clamped. Either one of these units may be disengaged by means of standard independent levers. This permits operator to change tools without disturbing the position of the head and column.

If operator does not wish to clamp head or column the operation of a small lever on the left-hand side of the head causes oil to by-pass these cylinders and render clamping mechanism inoperative.

This is only one of many advantages now available in Fosdick Hydraulic Radials. For complete information write for Radial Bulletin R. D. A.



HYDRAULIC & SENSITIVE RADIAL DRILLS

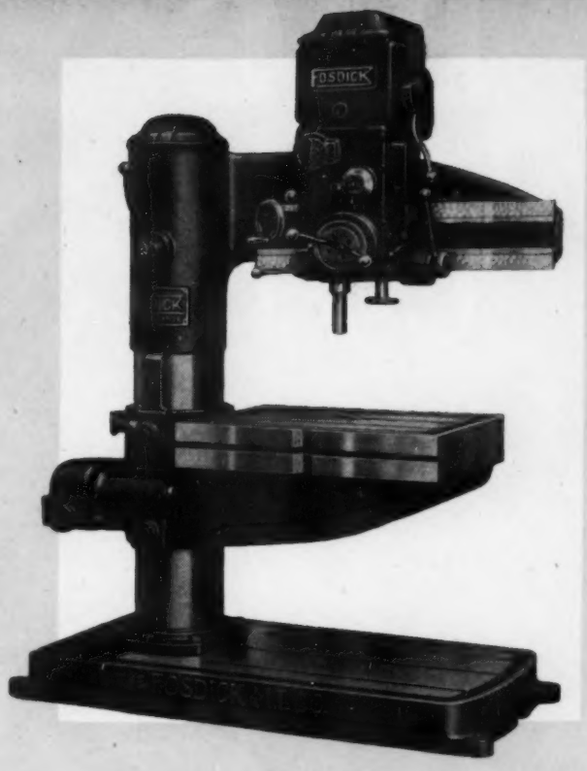
FOSDICK HYDRAULIC & SENSITIVE RADIALS

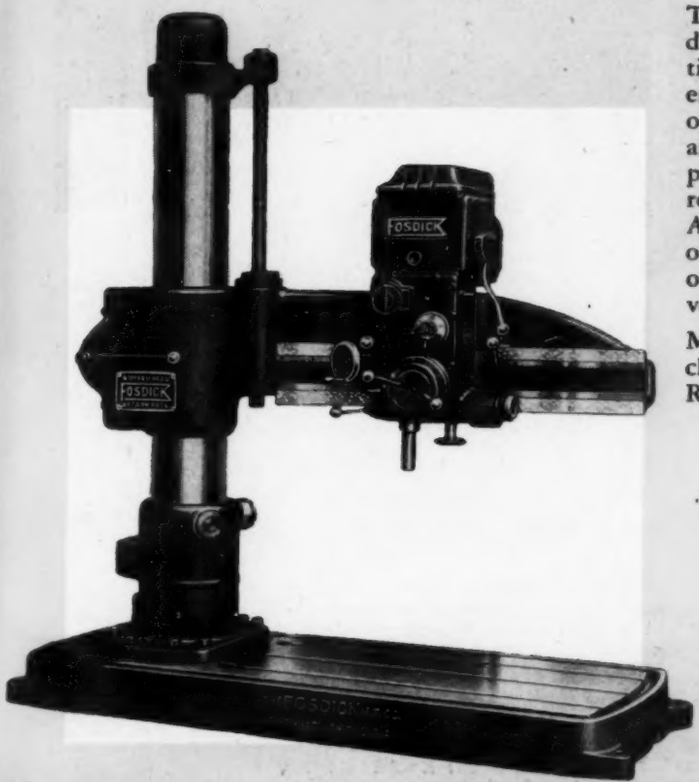
Fosdick now offers a sensitive radial for small work. This is an entirely new design with head at fixed height and a moveable table which slides up and down on a round column. Both head and table can be swung in an arc of 360°.

This design permits adjustment of the table to proper position for the work being handled. Table can be raised and lowered by hand or by power to desired position. The head always at the same height is always within easy reach of the operator.

The column being 12" in diameter at the bottom and 8½" at top and of one piece construction is considerably stronger than two piece construction. A key is fitted in the column to keep table perpendicular to base at any height. A lever on the table disengages key to permit table to swing around column. Also note work base for higher work with table swung around back of the machine.

Complete information sent on request.





3', 4', 5', ON 11" COLUMN FOSDICK RADIAL

This small machine has a head of extremely simple design—nine speeds—four feeds. It features an entirely new feed clutch and quick return mechanism employing a serrated clutch with diametrically opposed serrated blocks for engaging the feed—and is adjustable from the outside. A safety is provided at each end of the spindle travel. One revolution of the feed handle advances spindle 12". A fine feed hand wheel is provided at the bottom of the head. A two speed ratchet handle mounted on the right side of the head provides a more convenient means of hand feeding the spindle.

Many other new and time saving features are included in its design. For complete details write for Radial Drill 3 ft., 4 ft., 5 ft.-11" column bulletin R.A.

THE FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

• • • JIG BORERS • • • UPRIGHT & SENSITIVE DRILLS

BIG JOBS TOO

Machining a planer drive shaft on a 16" x 12' South Bend Lathe.

Versatility is always at a premium in toolrooms. Heavy jobs, intricate work, awkward shapes, and the multiplicity of operations all challenge the versatility of toolmakers and their tools.

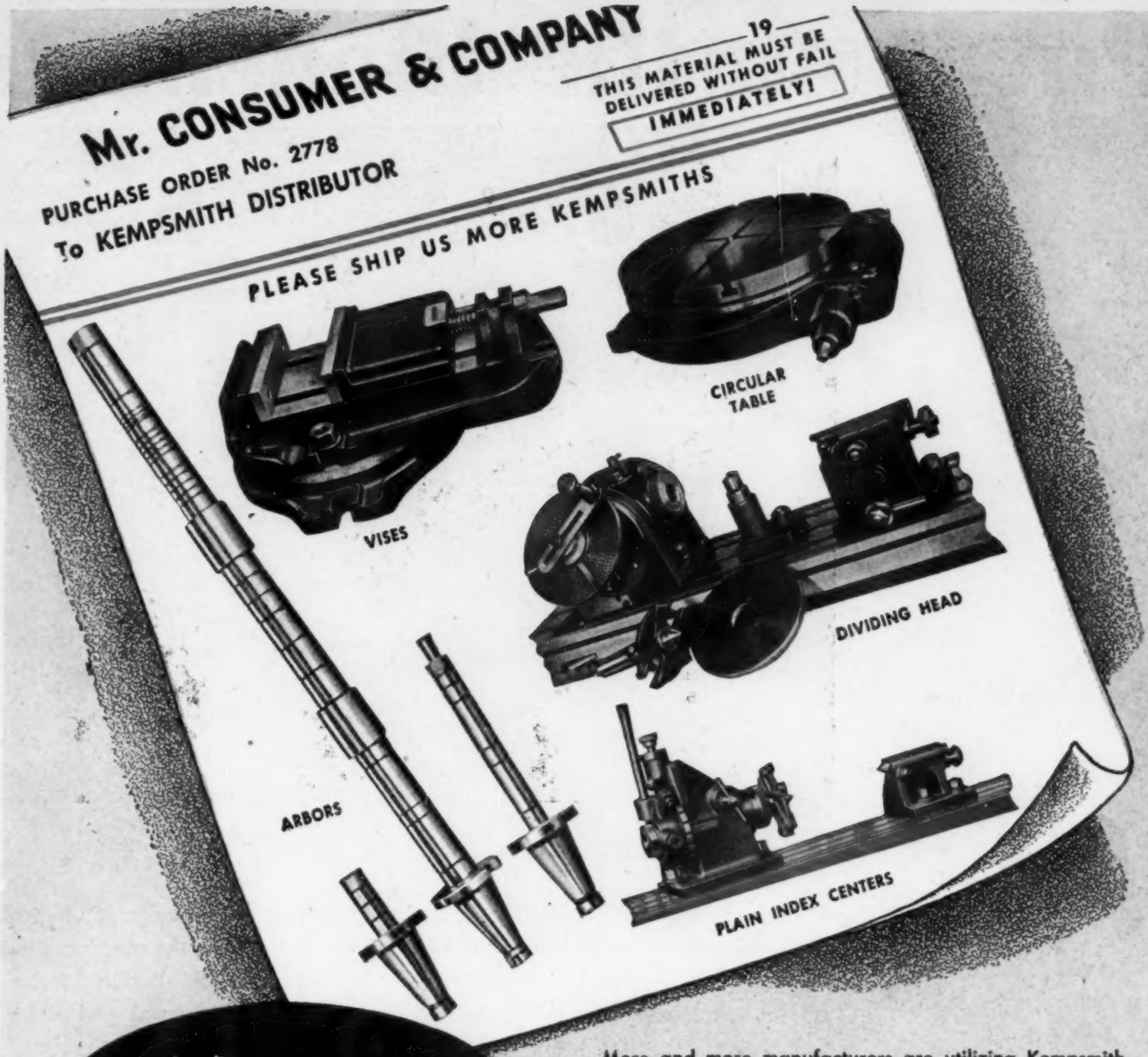
It is their versatility that makes South Bend Lathes so popular in toolrooms—their capacity for accurately machining anything from tiny instrument parts to heavy jobs like the one shown — plus their ability to perform efficiently a wide variety of machining operations. This is further increased by the many attachments available for simplifying special classes of work. All of which means that you can get more toolroom work done in less time with South Bend Lathes.

PROMPT DELIVERY from your local distributors' stock or early delivery from factory. **PRICES** start at $145.00, f.o.b. factory—average increase over prewar price level is less than 15%. **TIME PAYMENT** terms available—25% down—12 months to pay balance. **WRITE** for Catalog 100-F describing South Bend Lathes with 9" to 16" swings.

BUILDING BETTER LATHES SINCE 1906

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA



The *trend* in the Industry is Toward KEMPSMITH

More and more manufacturers are utilizing Kempsmith standard attachments to help solve their milling problems. Kempsmith precision-built milling machine accessories are made to perform the most delicate milling operations, with speed and accuracy. They frequently eliminate the need for expensive, single-purpose machines . . . cut production costs to rock bottom. And remember, every Kempsmith product is backed by Kempsmith's 57 years of specialized experience manufacturing milling machines and equipment exclusively.

SMALL TOOLS DISTRIBUTORS — Kempsmith has a new liberal sales plan for you. Write for further details.

THE KEMPSMITH MACHINE CO.
1823 S. 71ST STREET • MILWAUKEE 14, WISCONSIN, U. S. A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

A 5235-1P-C

Put it on the Blanchard

Machining a flat surface on lifting brackets

PRODUCTION RATE IS $5\frac{15}{17}$ TO ONE . . .

The very high rate at which a Blanchard removes metal makes it a logical, profitable choice for producing flat surfaces directly from the rough casting. In addition Blanchard Grinders usually provide operation saving, fixture saving, operational ease, safety and give greater flatness with improved surface finish.

Often these add up to amazing savings in time, increased production, and reduced cost-per-piece, as in the case of the above-illustrated cast iron lifting brackets. The *rough* castings—10" x 3¾" x 2½"—are blocked on the 16" diameter magnetic chuck of a No. 11 Blanchard Surface Grinder. One-eighth inch of stock is removed from one surface to produce desired tolerance.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

THE PRODUCTION RATE ON THE BLANCHARD IS 17 TIME UNITS PER PIECE AS COMPARED TO 100 TIME UNITS WHEN MACHINED BY THE FORMER METHOD.

It will in no way obligate you to find out what Blanchard Grinding can do in producing flat surfaces on your products. You (or your representative) may see the grinding of samples of your own work at our plant. Your only expense will be for transportation.

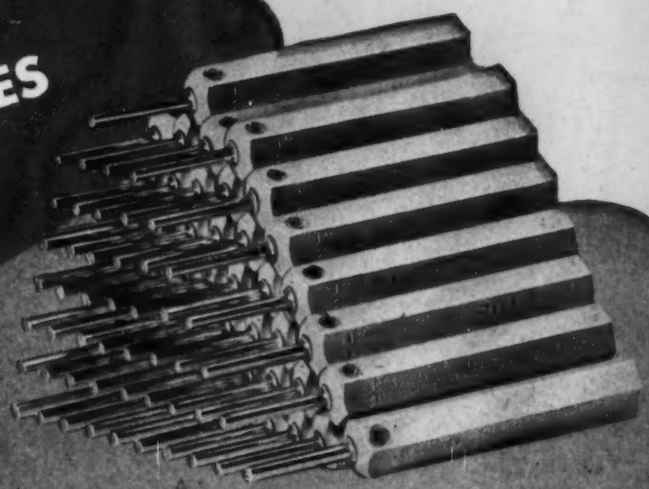
BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Van Keuren

CARBOLOY WIRE TYPE PLUG GAGES



1 VAN KEUREN CARBOLOY GAGE = 50 TOOL STEEL GAGES

Wire type plug gages were originated by The Van Keuren Co. in 1925 and are now recognized as the most economical gages for measuring small holes.

The original wire type plug gages were made of tool steel. The use of high speed steel doubled gage life. Precision chrome plate gave five times the life, and now gages of carboloy are available with fifty times the life of tool steel. All of these materials are still in use and have their particular applications and advantages.

VK Carboloy gages are made in sizes from .020" diameter to .250" diameter. They are available only in the wire type design as this is by far the most economical small plug gage. In cases where it is desired to use Van Keuren carboloy wire type Go units with existing No Go units of the taper insert design, special handles can be furnished for this purpose. Van Keuren wire type plug gages assure longer lasting precision and lower gage cost because the entire 2" length of gage unit can be used. When the end becomes worn it is ground off and a new section of the original accuracy is moved out for use. The wire type unit is securely held in the handle by a split bushing and a headless set screw.

VK Carboloy wire type plug gages are made to Class B accuracy, plus .00005" minus .00000" on the Go unit and plus or minus .000025" on the No Go unit. Closer or wider tolerances can be supplied if desired.

On your next order specify VK wire type plug gages. VK Carboloy for long runs because of the enormous saving in gage cost. VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that the parts will be within the specified limits. VK Tool Steel—High Speed—Precision Chromium for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

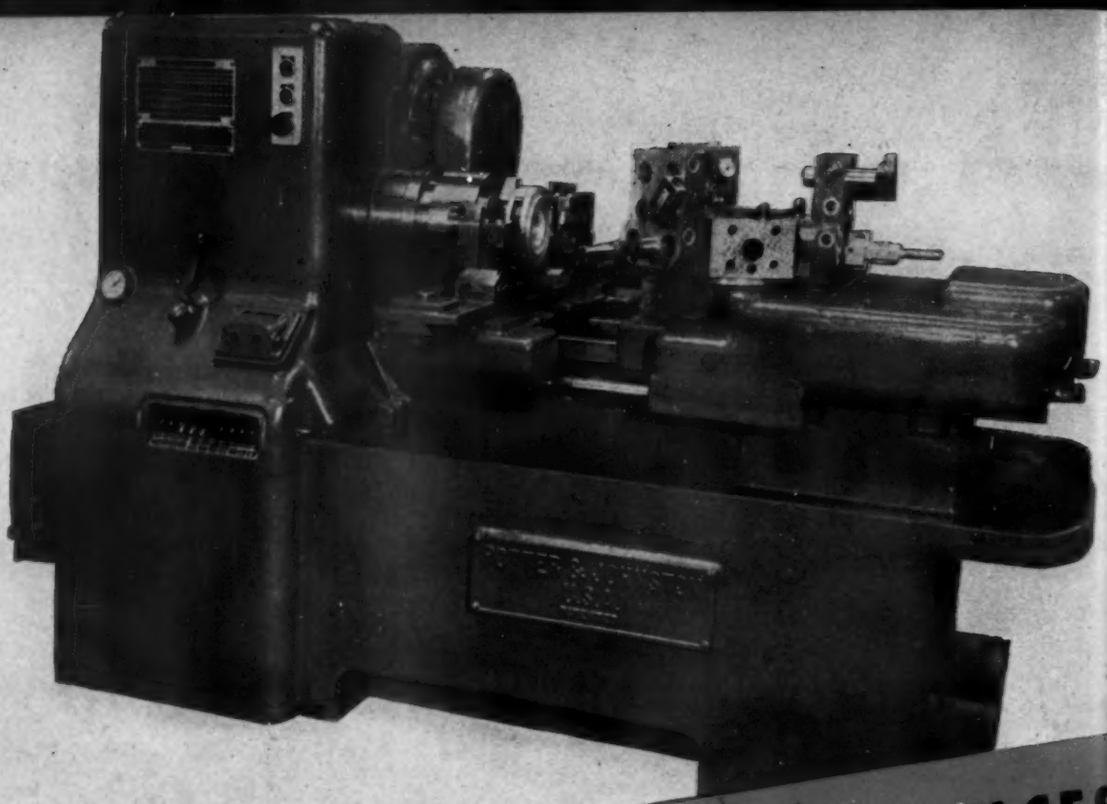
Write for circular C 35 on Carboloy wire type plug gages, Thread measuring wires and Gear wires.

Write for your copy of catalog and handbook No. 33. It contains complete information on Van Keuren precision gages and instruments and valuable engineering formulas and data on measuring problems.

THE Van Keuren CO., 176 WALTHAM STREET, WATERTOWN, MASS.

27th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.



A FIRST in '47

POTTER & JOHNSTON ANNOUNCES

THE NEW 3U *Speed-Flex* AUTOMATIC TURRET LATHE

. . . for high output and low cost production of small duplicate parts . . .

This latest P&J development provides the means for machining small castings and forgings up to six inches diameter and approximately four inches long. With the advent of this modern, fast, high output machine, small work can now be assigned to a machine specially designed for handling it, thereby eliminating the necessity for tying up and operating large machines having capacities far in excess of requirements. With the 3U *Speed-Flex* Automatic Turret Lathe a machine is now available which will exactly fit a wide range of small work . . . and achieve the quality and economies in production prerequisite in today's manufacturing.

POTTER & JOHNSTON invites production men in every branch of metal working to explore the time, power, effort and cost savings made possible through the advent of the P&J 3U *Speed-Flex* Automatic Turret Lathe.

POTTER & JOHNSTON MACHINE CO.,

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, RHODE ISLAND

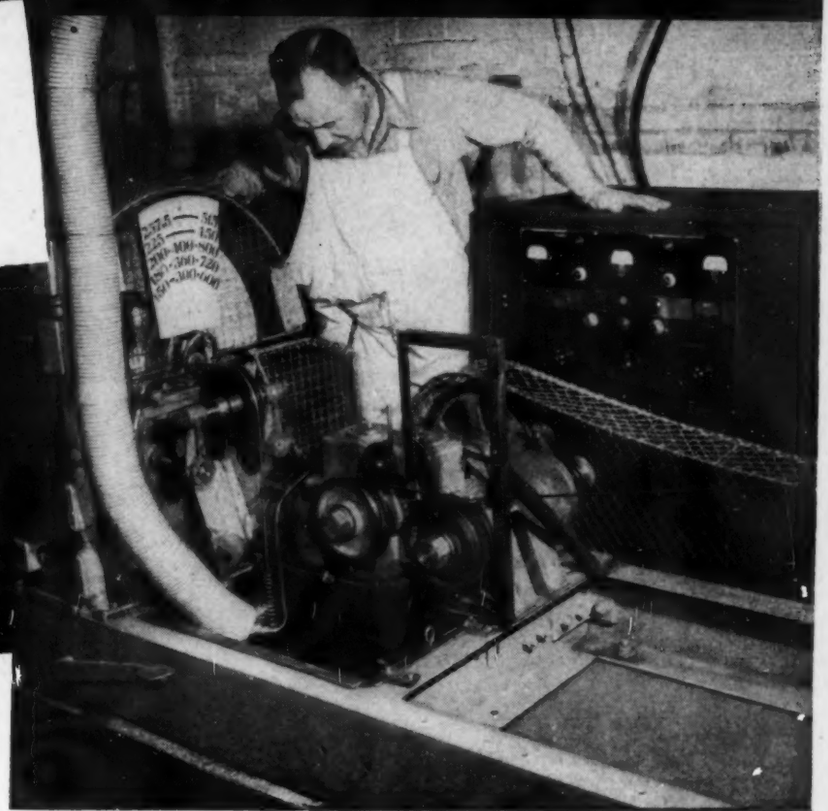
ELECTRONIC HEATER CUTS HANDLING COSTS BY CONTINUOUS STRESS-RELIEVING

THE JOB . . .

At Teleflex Inc., Philadelphia, an important step in the manufacture of steel control cable is heat treating, in order to reduce stresses resulting from the stranding operation.

THE OLD METHOD . . .

In order to stress-relieve cable in a gas-fired furnace at the production rate of the stranding machine, it was necessary to wind the strander's output on four separate reels. After these costly handling and reeling operations, four cables were run through the furnace in parallel, quenched, and reeled.



THE *NEW* INDUCTION METHOD

Out of the strander . . . Into the heater . . . On to the reel

The cable is now passed from the strander directly into the work coil of a G-E 5-kw electronic induction heater, where it is stress-relieved at stranding speed. After heat-treatment, the cable passes into a lard-oil quenching bath and directly on to the reel for final inspection. The entire operation is performed continuously in a compact, automatic equipment.

HERE'S WHAT INDUCTION HEATING HAS DONE FOR THIS COMPANY

1. **Cut Costs**—by eliminating intermediate winding operations, substantial savings are realized on labor and equipment.
2. **Reduced Floor Space**—by making possible a compact, efficient equipment, 300 square feet of floor space are now available for other purposes.
3. **Better Product**—with induction heating's close quench control, overdeposits of carbon are eliminated, giving a cable of a higher, more uniform quality.
4. **Increased Efficiency**—by helping to make cable manufacture a continuous operation.

WHAT CAN ELECTRONIC INDUCTION HEATING DO FOR YOUR PRODUCT?

We would welcome the opportunity to give you an unbiased answer to this question. Simply get in touch with the Heating Specialist in the nearest G-E Office. In the meantime, send the coupon for our free bulletin GES-3290A, "The How and What of Electronic Induction Heating."

GENERAL ELECTRIC

Apparatus Department, Sect. C675-153
General Electric Company
Schenectady 5, N. Y.

Please send me your free bulletin GES-3290A, "The How and What of Electronic Induction Heating."

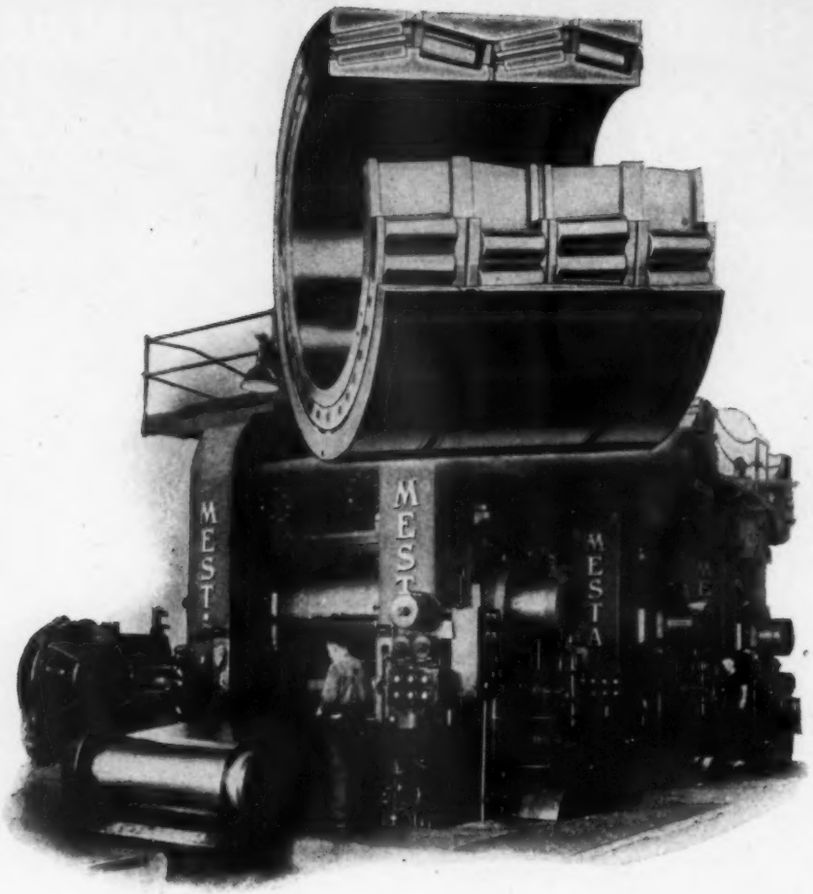
Name .....

Company .....

Address .....

City ..... State .....

678-18



Roll out record tonnages . . .

by securing higher rpm on roll necks . . . increased neck diameter *and* greater bearing capacity . . . longer service life . . . reduced power requirements . . .

with Torrington Roll Neck Bearings.

These four-row tapered roller bearings are engineered for higher ID in proportion to OD, allowing greater roll neck cross-sections. Their radial and thrust capacity is increased through closer spacing of rollers, made possible by pin-type retainers. High nickel content alloy steel is employed for maximum resistance to shock, wear and fatigue.

Set new standards of production by standardizing on Torrington Bearings for heavy-duty equipment.

THE TORRINGTON COMPANY

SOUTH BEND 21, IND. TORRINGTON, CONN.

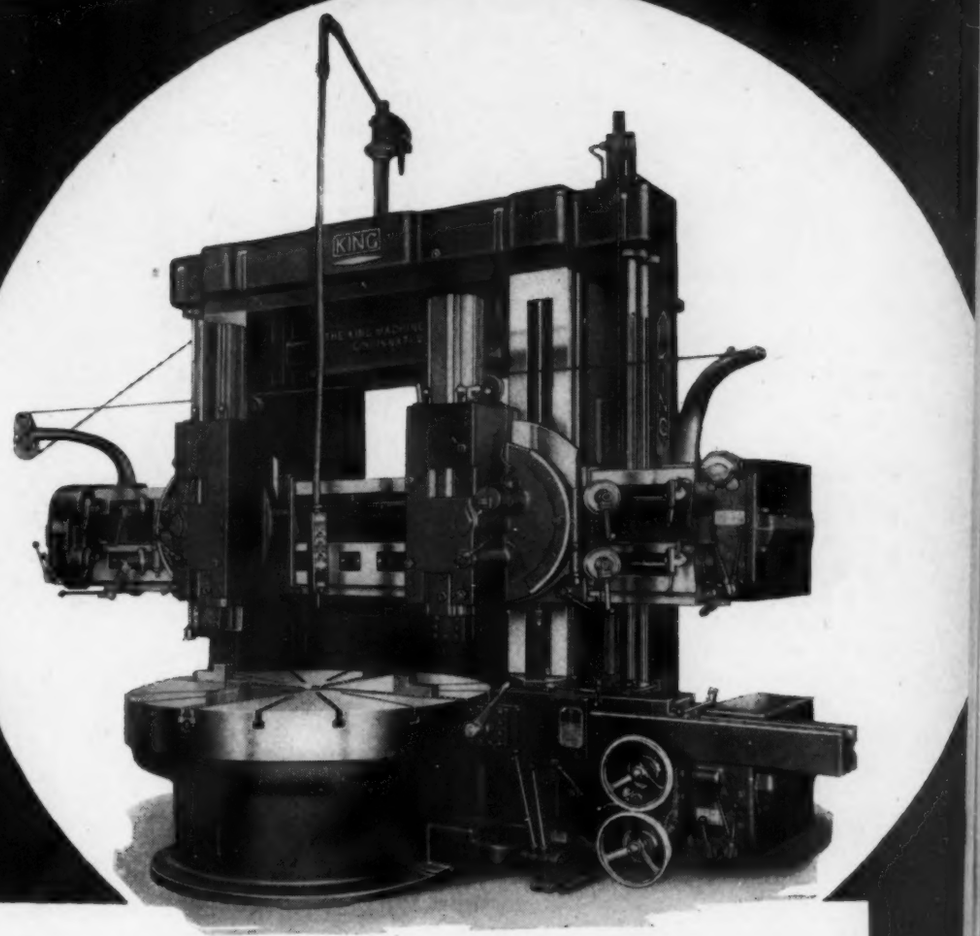
Offices in All Principal Cities

TORRINGTON BEARINGS

• NEEDLE • SPHERICAL ROLLER • STRAIGHT ROLLER • TAPERED ROLLER • BALL •

5 reasons why the NEW SERIES KING is meeting increased production demands

- A substantially heavier machine
- New accurate swivel ram heads
- Increased range of speed
- Greater rigidity
- Simplified control



● The five features listed are a few of the many improvements incorporated in the design of the new series King Vertical Boring and Turning Machines to meet the increasing demand for greater production at lower costs.

The result is a more powerful, accurate machine. The increase in weight plus new massive, rectangular type ram heads provides added rigidity necessary to the successful use of carbide tools.

Locating all control levers at the front of the machine gives operator instant control of all tool movements and keeps control levers within easy reach on all jobs. Thus enabling operator to get maximum production with minimum of effort.

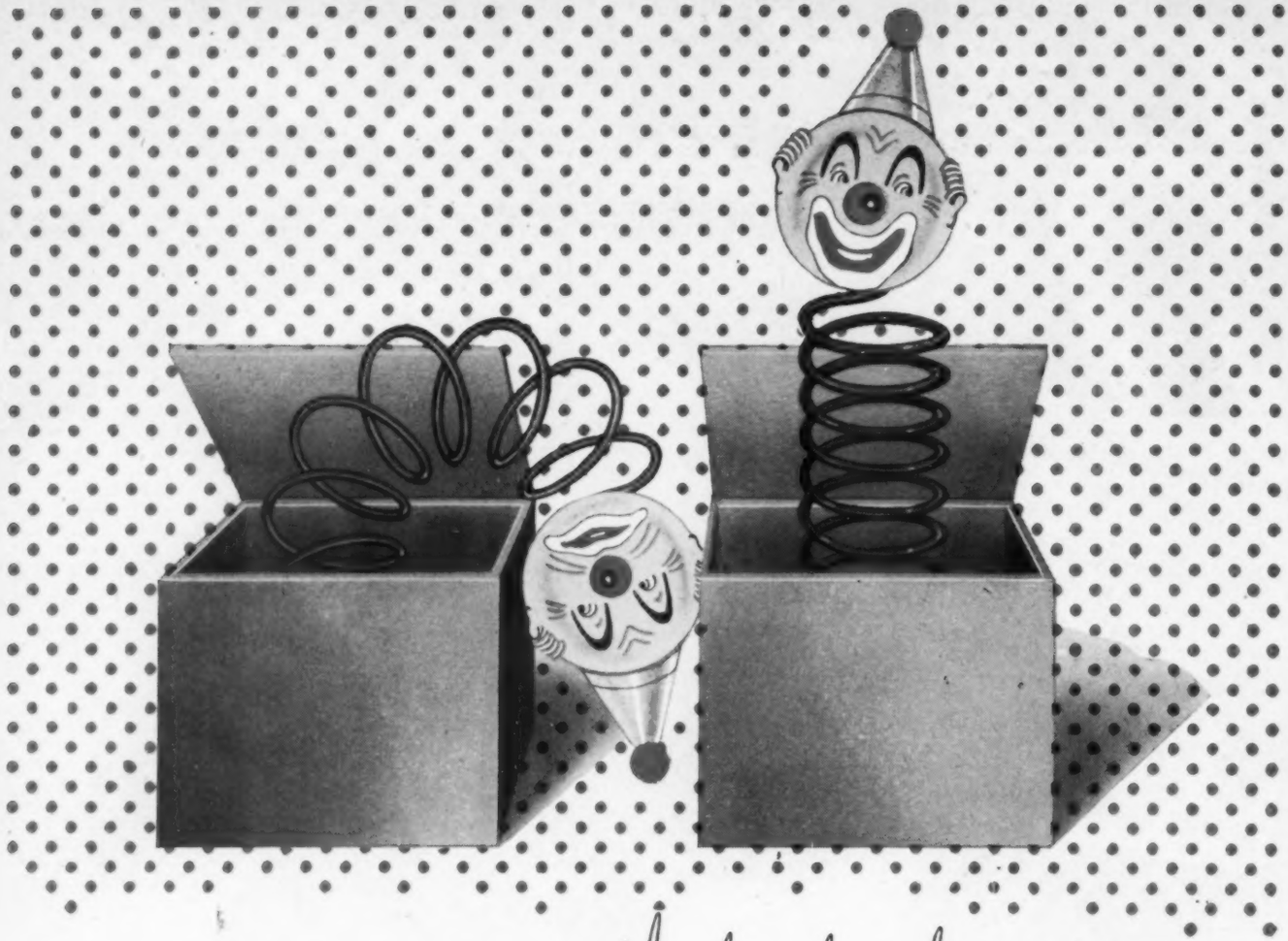
The new King Vertical Boring and Turning Machines are available in 10 sizes—Single Column Type—30", 36", 42", Double Column Type 52", 62", 72", 84", 100", 120" and 144".

Consult a King Engineer on your work or write for full descriptive bulletin.

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines and Sebastian Lathes



For springs *that stand up!*

THESE TWO TOYS point out a moral to spring buyers. Just because springs *look* alike doesn't mean they will *perform* alike.

To be sure the springs you buy give top performance specify U·S·S American Quality Springs.

These superior springs resist fatigue . . . hold their shape with unusual success . . . give additional life to your product.

When you specify American you get better springs for your product. And our unexcelled production facilities mean that you can usually count on speedy delivery of springs in *whatever* quantity you need.

Whether you buy springs ready-made or make them yourself, bring your spring problem to us. Our experts will see to it that you are supplied either with exactly the right springs for your job, or with the best spring wire obtainable for making your own springs.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco,
Pacific Coast Distributors

Tennessee Coal, Iron & Railroad Company, Birmingham,
Southern Distributors

United States Steel Export Company, New York

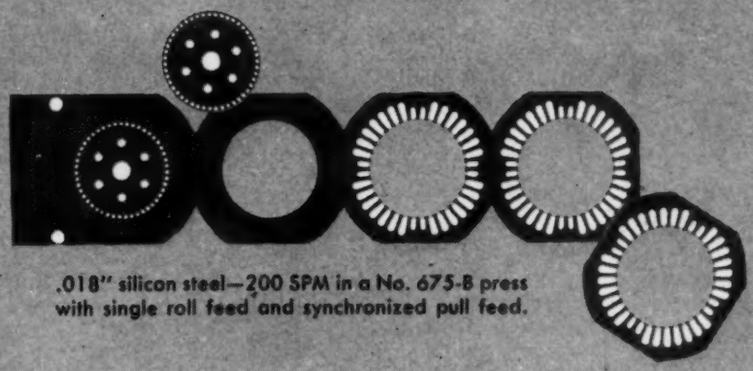
UNITED STATES STEEL

AMERICAN STEEL & WIRE COMPANY · USS · AMERICAN SPRINGS · UNITED STATES STEEL

U·S·S American Quality Springs

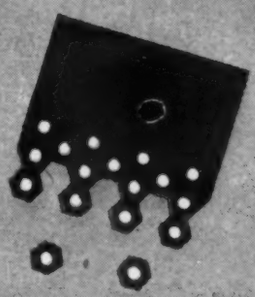
Why You Increase Output and Cut Costs

On *Bliss* High-Production Presses



.018" silicon steel—200 SPM in a No. 675-B press with single roll feed and synchronized pull feed.

.089" steel—165 SPM in a No. 675 press—two pieces per stroke.



.132" brass—300 SPM in a No. 630 press with single roll feed.

CHECK THESE FEATURES

Eliminate lost man-hours from intermediate handling between operations—Bliss High-Production Presses are specially engineered for Progressive and Compound Dies...increase output per man.

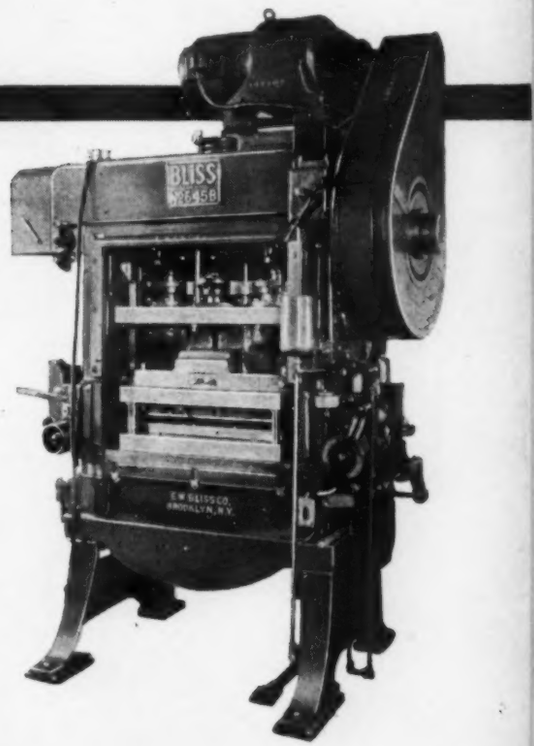
Minimize set-up time—all dies and adjustments are within easy reach of operator.

Control Speed and production ratio within the limit of tool and maintenance economy.

Step up operating pace with special feeds. Double roll or single roll feed can be mounted on right or left side of press.

Increase Die Life—slide alignment is maintained even under severe off-center loads through use of two connections and square gibbing...accurately finished.

Keep Down-time and Maintenance at a minimum—parts are easily accessible. Forced feed lubrication to all main bearings. Electric controls to supplement operator when press operates at high speed.



You don't have to speed up a Bliss High-Production Press until it cries "Uncle" to increase output and cut costs. In engineering it, Bliss didn't stop with increased strokes per minute but, what's more important, made possible higher ratio of productivity...greater press output. Some of the ways this is accomplished on Bliss High-Production Presses are enumerated in the above chart. Check your performance against it.

The accompanying examples show complex work achieved with one stroke, one press, one man. These are but a few of the stampings produced on Bliss High-Production Presses. You, too, can increase your output and reduce costs. Start by writing today for our catalog No. 27.

E. W. BLISS COMPANY, DETROIT 2, MICH.

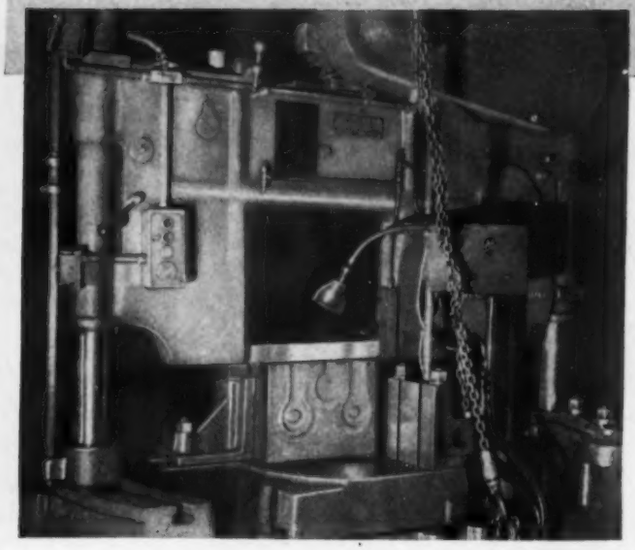
Mechanical and Hydraulic Presses, Rolling Mills, Can and Container Machinery

WORKS AT: Brooklyn, N. Y.; Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Derby, England; St. Ouen sur Seine, France.
SALES OFFICE: Detroit; New York; Brooklyn; Cleveland, Dayton, Ohio; Hastings, Mich.; Chicago; Philadelphia, Pittsburgh, [illegible]; Rochester; New Haven; Boston; Windsor, Ont.

STAY AHEAD WITH *Bliss*

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY

Marvel Saws Cut off Hours from Die Maintenance Time



Hubbard & Company, Pittsburgh, manufacturers of pole line hardware, picks, hammers and other drop forged specialties, use MARVEL Saws to eliminate tedious hours in making and maintaining their giant forging dies. Not only do these saws do all regular cutting-off of steel for the machine shop, die blocks for die shop and exact size billets for the forge shop, they also materially cut the cost of die maintenance.

Previously, it was necessary to plane the face of dies being reworked. This was a long and tedious job because the die face is always work-hardened with hard spots that had to be chipped or ground out before the planer tool could make a cut. Now with MARVEL Saws, the face of a die is speedily and accurately "skinned"—a thin slice is sawed off just behind the hard spots, after this speedy "skinning" and a single facing cut on the planer, the die is ready for the die sinker. This modern MARVEL method is saving Hubbard a lot of dies, materials, labor and machine time.

Below (left) is a Model 9A MARVEL High Speed Production Saw, with automatic bar push-up, which automatically cuts off billets to exact size (ends fin waste), and, a No. 18 MARVEL Giant Hydraulic Hack Saw for cutting-off large bars and billets and trimming dies in sizes up to 18"x18" cross section.

For quick reference see our section in Sweet's File—Mechanical Industries, or write for catalog.

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"

5700 Bloomingdale Ave.
Chicago 39, U. S. A.

DRAW THE LINE ON HIGH-COST FINISHING LABOR

with Permanent-Mold Castings of American Magnesium!

AND GAIN A BONUS IN LIGHTNESS!

The hours of high-cost labor required for rough machining, finish machining, and finish grinding are reduced to a fraction with permanent-mold castings of American Magnesium. Made to close limits, they machine easily, at high speed. The first cut is usually the finish cut.

In addition, your product gains a bonus in lightness, for American Magnesium is 35% lighter than aluminum, 75% lighter than steel!

These advantages mean actual labor savings in hundreds of dollars. And the 59 years of light-metal know-how of Aluminum Company of America are ready to help you take full advantage of them. Call your nearest Alcoa sales office, or write ALUMINUM COMPANY OF AMERICA, sales agent for American Magnesium Products, 1709 Gulf Bldg., Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO Reg. U.S. Pat. Off. PRODUCTS

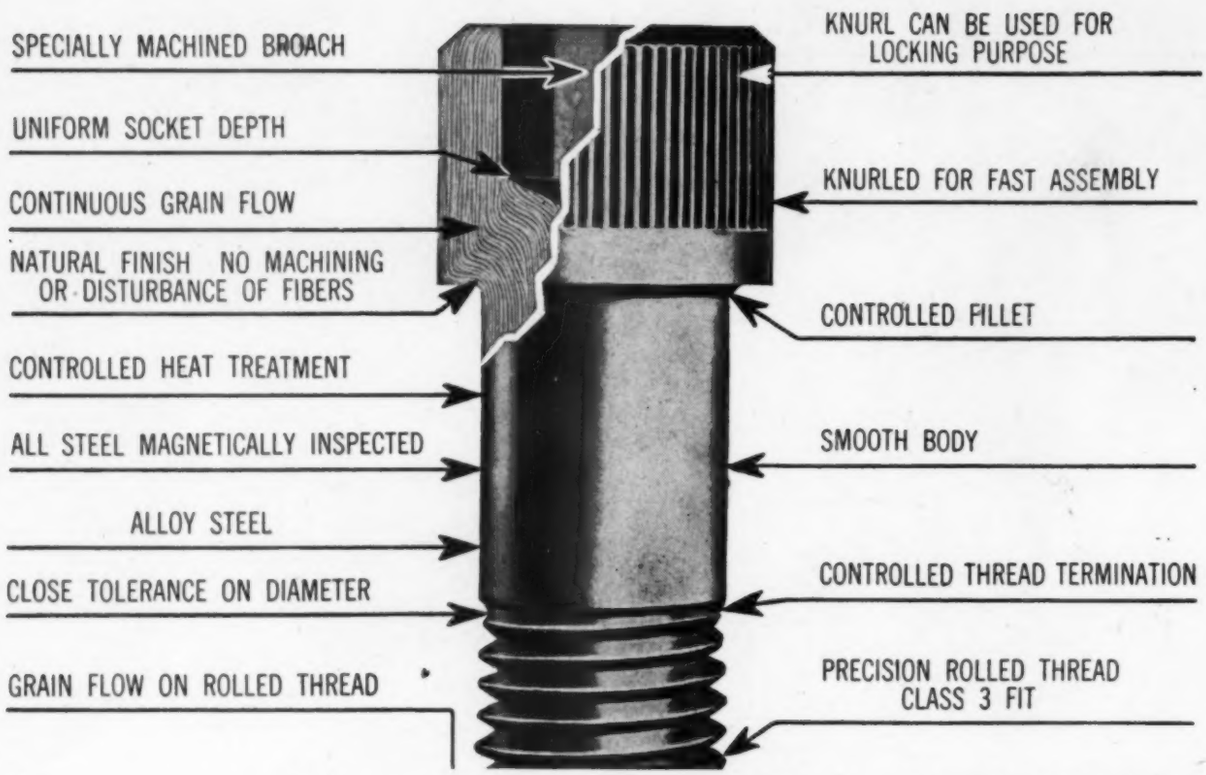
AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

These IMPORTANT FEATURES *of*

UNBRAKO KNURLED SOCKET HEAD CAP SCREWS

REG. U. S. PAT. OFF.

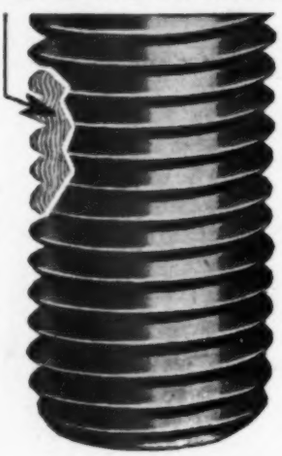


Give you these OUTSTANDING ADVANTAGES

STRENGTH, TOUGHNESS, RELIABILITY . . . the result of constant testing, inspection and quality control.

KNURLED HEAD FOR EASY ASSEMBLY . . . the knurled head provides a slip- and fumble-proof grip, even for the most oily fingers, therefore, the screw can be screwed-in faster and farther before it becomes necessary to use a wrench.

We also make the famous "Unbrako" Socket Set Screw with the "Self-Locking" Knurled Cup Point, and the "Unbrako" Socket Set Screw with the "Self-Locking" Knurled Threads.



OVER 44 YEARS IN BUSINESS

EASY START THREAD POINT . . . specially designed to assure fast, easy thread start.

INTERNAL WRENCHING . . . to promote Compact Designs which save space, material, weight and costs. Write for your copy of the "Unbrako" Catalog.

"Unbrako" and "Hallowell" Products are sold entirely through distributors.

Knurling of Socket Screws originated with "Unbrako" in 1934.

STANDARD PRESSED STEEL CO.

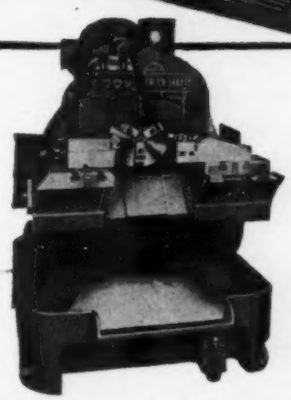
JENKINTOWN, PENNA., BOX 4 · BRANCHES: BOSTON · CHICAGO · DETROIT · INDIANAPOLIS · ST. LOUIS · SAN FRANCISCO

PROOF—you can get finished parts FASTER with the new Acme-Gridley 12" Chuck-matic

This new single spindle chucker is built for heavy-duty cutting and a minimum of idle time for loading and unloading.

The typical machine times shown above aren't theoretical. They're only a few examples of the kind of work (both short and long run) you can turn out in less time—accurately—at lower cost.

If you're doing heavy-duty chucking work, you'll be interested in a new book we've prepared. It shows 16 jobs similar to the one above—all done on the Chuck-matic. Ask for bulletin SC 46-A.

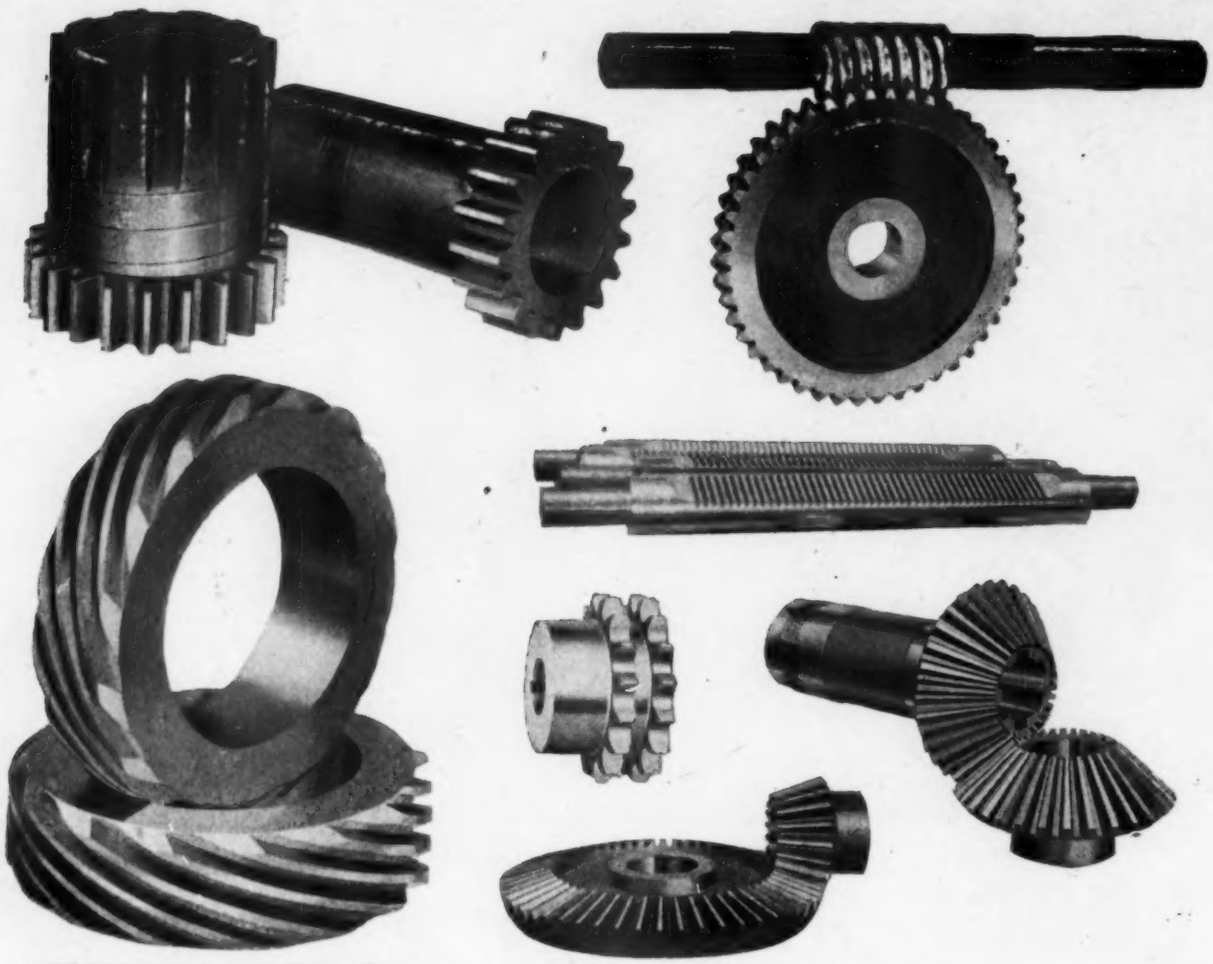


The rugged, powerful Chuck-matic is built for speeds and feeds as fast as carbide-tipped tools can take it. Compact, yet simple in design, its operation is semiautomatic. An unskilled operator can run as many as four machines.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



The ADAMS Line

Spur Gears
Helical Gears
Bevel and Miter Gears
Worms and Worm Gears
Internal Gears
(spur and helical)
Sprockets
Ratchets
Splined Shafts
Racks
Lead and Feed Screws
Ground Tooth Gears
(spur and helical)
Shaved Tooth Gears
(spur and helical)
Ground Thread Worms

Quality control at ADAMS *pays you dividends!*

In every stage of their manufacture, Adams precision-made gears are subjected to rigid inspections for quality control and to assure exact conformance with your specifications. The inspections go on continuously in the shop and in the modern Adams gear checking department. This careful attention to detail right down the line pays you dividends in two ways—it means fewer rejects and it means better performance for your product. When you need gears, call on Adams for high quality gears made *exactly* to your specifications. THE ADAMS COMPANY 1942 Bridge Street, Dubuque, Iowa.

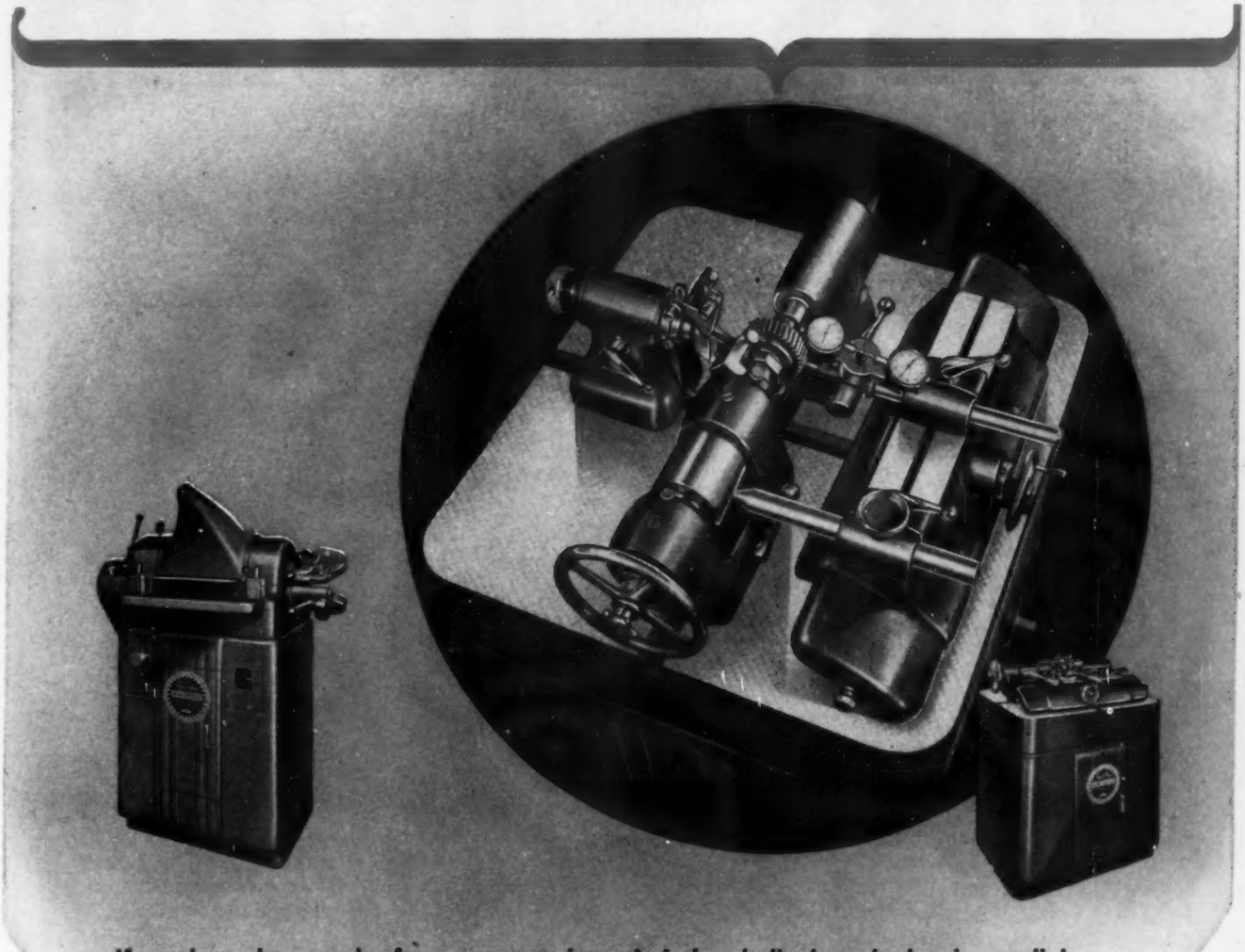
The ADAMS Compa

Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1882

FIRST MEASURE YOUR GEAR ERRORS AND GEAR NOISE THEN CORRECT THEM



If you know how much of an error you have in index, helical angle, lead, parallelism, tooth size, eccentricity or interference, you can determine what must be done to correct it.

If there is apt to be objectionable noises in a gear train, find out before those gears are assembled just how much noise they will make in operation. Then you can take the necessary steps to correct for noise without paying unnecessarily for both assembly and disassembly.

The Red Ring Universal Gear Checker and Gear Sound Tester will permit you to accurately evaluate gear errors and gear noises. The Sound Tester will, by the character of the sound produced, indicate its cause.

Write for descriptive folders on these machines.

2525

RED RING PRODUCTS

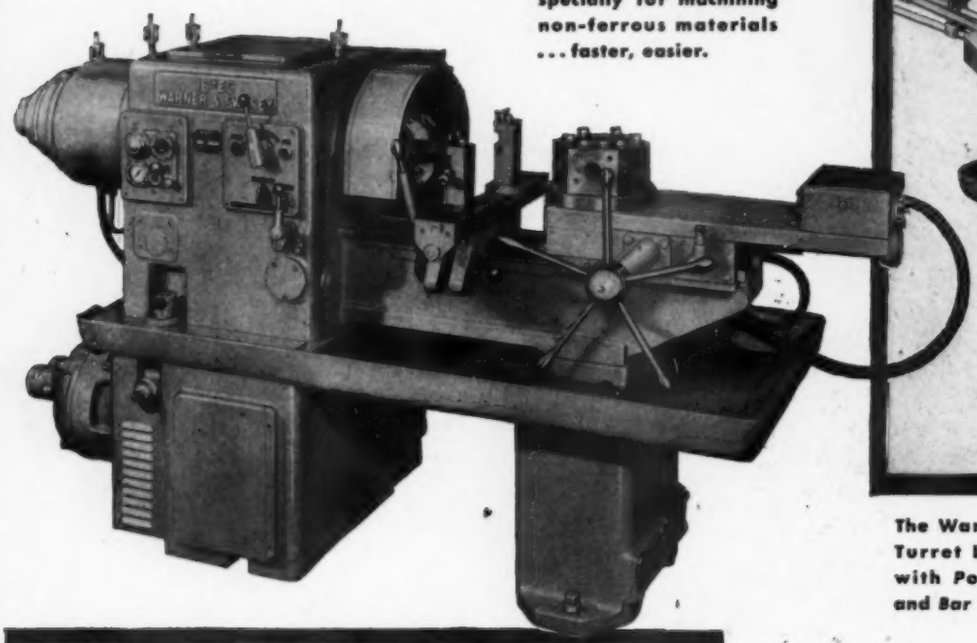
NATIONAL BROACH AND MACHINE CO.

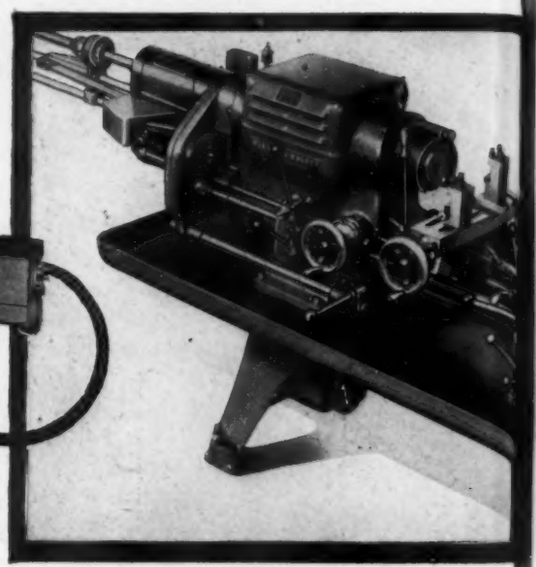
5600 ST. JEAN • DETROIT 13, MICHIGAN

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

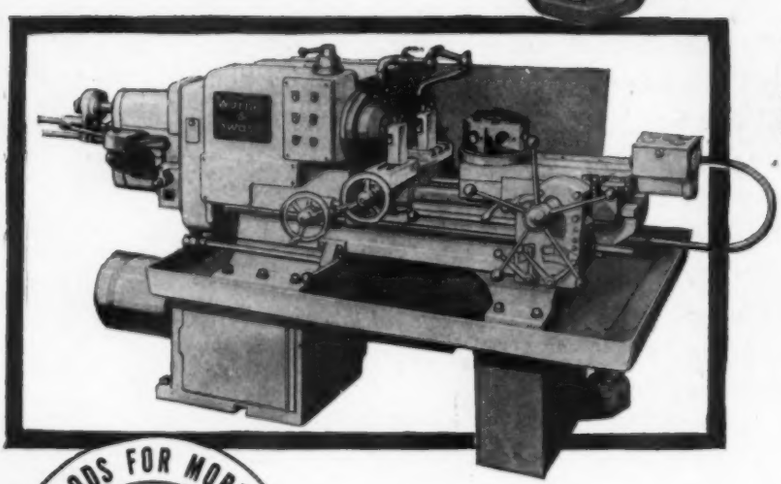
JOBS WANTED!

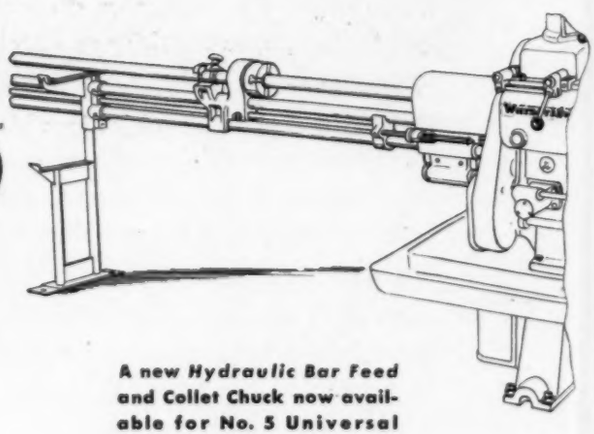
The new ELECTRO-CYCLE Turret Lathe developed specially for machining non-ferrous materials ... faster, easier.





The Warner & Swasey No. 1 Electric Turret Lathe can now be furnished with *Power Automatic Collet Chuck* and *Bar Feed* as standard equipment.





A new *Hydraulic Bar Feed* and Collet Chuck now available for No. 5 Universal Turret Lathe; takes only 1/20 the effort needed for manually operated units.

Now for the first time "*Electro-Cycle*" *Type Control* is adapted to Warner & Swasey Turret Lathes for faster turning of "hard metals".

MORE GOODS FOR MORE PEOPLE AT LOWER COST

YOU CAN MACHINE IT BETTER, FASTER,

STAR PERFORMERS INTRODUCED AT THE 1947 MACHINE TOOL SHOW NOW WANT STEADY WORK

The machines shown are some of the new Warner & Swasey developments demonstrated at the Machine Tool Show. They offer alert production men specific ways to increase production and reduce manufacturing costs.

For further information, call in your Warner & Swasey field man or write Warner & Swasey, Cleveland, Ohio.

A brand new *SINGLE SPINDLE AUTOMATIC CHUCKING* Machine offers a new concept of rigidity, ease of set-up and cross slide selectivity.

NEW FIVE-SPINDLE AUTOMATICS, BAR and CHUCKING TYPES eliminate cam changes...make automatic operation practical and profitable on small lots as well as on long runs.

Newly designed PRECISION TAPPING and THREADING MACHINES featuring exclusive LEAD SCREW PRINCIPLE and SOLENOID ACTUATED GUIDE FINGERS.

An entirely new line of EXTRA HEAVY-DUTY SCROLL CHUCKS for greater, safer gripping power. Sizes 8" to 24". Adaptable to nearly all models of lathes having type A1 American standard flange spindle nose.

Turret Lathes
•
Single and Multiple Spindle Automatics
•
Precision Tapping and Threading Machines

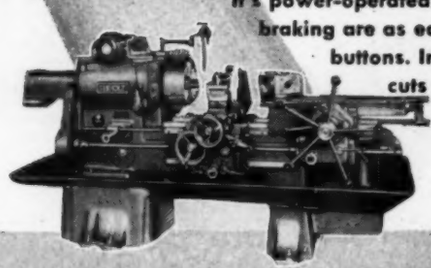
WARNER & SWASEY
Machine Tools
Cleveland

FOR LESS . . . WITH A WARNER & SWASEY

GISHOLT TURRET LATHES

Finger-tip spindle control starts, stops, or reverses the spindle. Saves time--saves effort--saves money

It's power-operated. Clutching and braking are as easy as pressing buttons. Instant response cuts time lag, steps up production.



GISHOLT MACHINE COMPANY *Madison 3, Wisconsin*

The GISHOLT Round Table represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.

turret lathes • automatic lathes • superfinishers • balancers • special machines

New Method Combines 4 Finishing Operations

The unique new machine shown above was developed by Cross to meet unusual job requirements. By combining four finishing operations at one time, accumulation of errors is eliminated and uniform quality is assured—at less cost.

Use has been made of standard Cross units which are easily adapted for a variety of simultaneous or separate operations of boring and facing.

The machine is a typical example of how Cross engineering and craftsmanship obtain profitable productivity.

PART: Cylinder block with clutch housing assembled.

OPERATION: Bore, chamfer, and face clutch housing; also straddle face main bearing thrust surfaces—all simultaneously.

PRODUCTION: 41 pieces net hourly.

FEATURES: ◇ Uses unskilled labor ◇ Push-button control ◇ Block located and clamped by power ◇ Fully automatic machining cycle ◇ Single point, carbide-tipped, cutting tools ◇ Independent feed rates ◇ Dual feed rates for straddle facing includes automatic feed reduction during return travel for finishing thrust faces ◇ Bar feed for boring and chamfering ◇ Separate facing feed produces "phonograph finish" on clutch housing for seating gasket securely.

Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.

THE **CROSS** COMPANY

Established 1898

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SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

Sheave to Transmit 1400 Horsepower...

...or a Belt for a 1/4 hp Compressor!

CALL ON THE TEXROPE LINE for the *best* in V-belt engineering and V-belt equipment. That has been true for 22 years — ever since Allis-Chalmers originated the Multiple V-belt drive for industry.

Back of every *Texrope* installation — from fractional horse power V-belts that manufacturers put on washers, air-compressors or water systems—to the biggest V-belt drives ever designed and successfully applied—stands the finest V-belt engineering talent in the world.

There's no substitute for this vast experience and tremendous fund of knowledge. It is reflected in every *Texrope* product.

What do *you* need... a few V-belts and sheaves — or a daring new application of the multiple V-belt principle? Call on the *Texrope* line! Equipment and engineering help are as close as your nearest A-C sales office or dealer. ALLIS-CHALMERS, MILWAUKEE.

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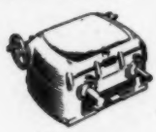
TEXROPE ..Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

Now—MULTIPLY the UTILITY of SURFACE GRINDERS

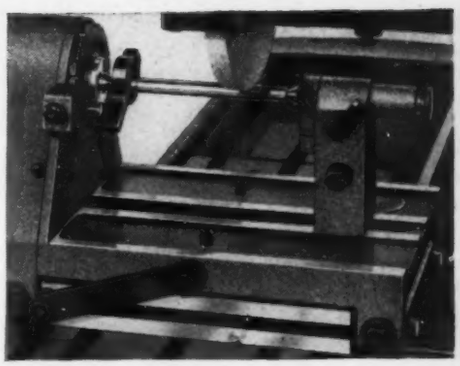
Gain cylindrical grinding facilities with NEW No. 616 ATTACHMENT

● For dry grinding small cylindrical work, tapers and work requiring indexing, the new Brown & Sharpe Cylindrical Grinding and Indexing Attachment extends the usefulness of surface grinders. It saves time and expense and often makes unnecessary the installation of extra cylindrical grinding equipment.

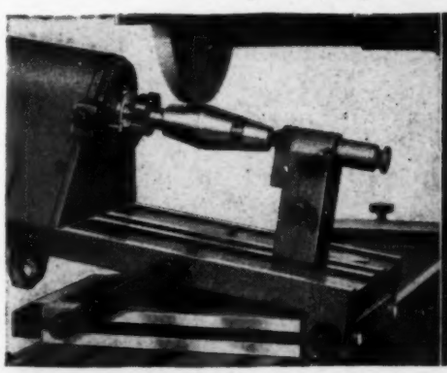
Straight cylindrical or tapered work is ground between centers or if ½" diameter or less, can be held in the indexing spring chuck. Indexing is performed with headstock index plate or with interchangeable indexing spring chuck.

Centers swing 6" diameter, take work 5¼" in length. Maximum grinding angle, 45°. 1/60 H.P., 115 V., A. C. motor is completely enclosed. Write for illustrated folder about the new time-and-money saving No. 616 Cylindrical Grinding and Indexing Attachment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

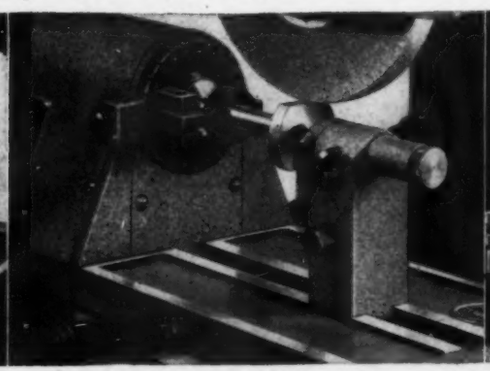
We urge buying through the Distributor



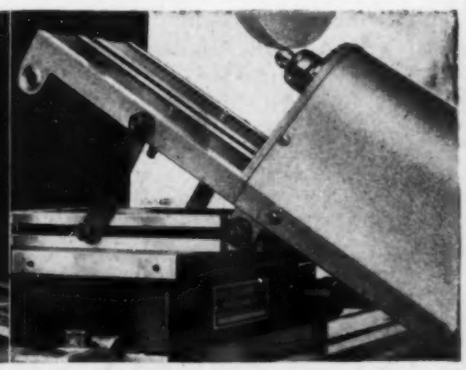
● Grinding work held between centers. Tailstock center is withdrawn for work change by simple swing of lever.



● Grinding taper shank. Attachment is adjustable to the desired taper.



● Grinding parallel flats using index plate. Index plate has 24 slots and is locked or released, by plunger.

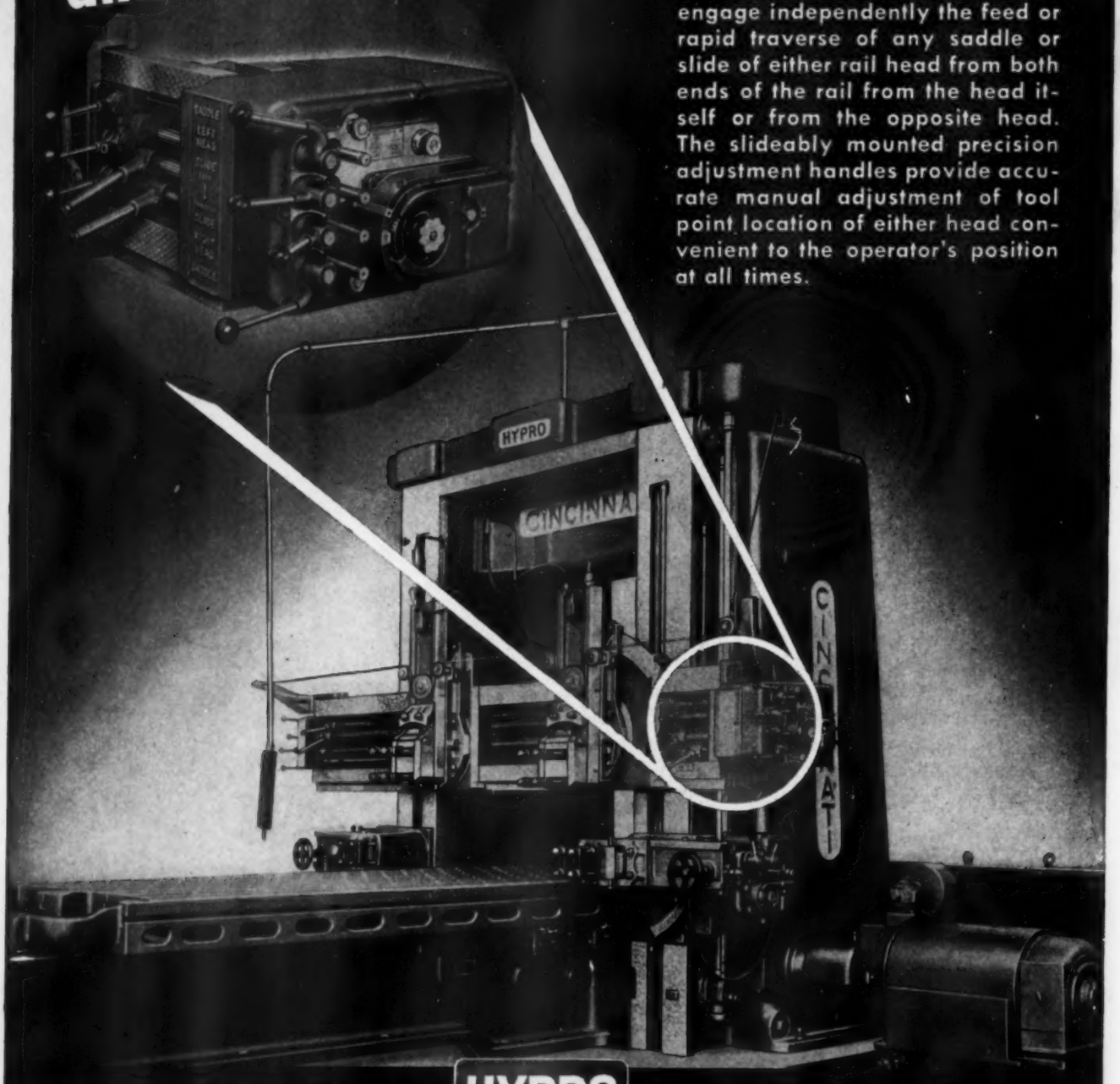


● Angular grinding of work held in spring collet. Attachment is held on permanent magnet chuck.

BROWN & SHARPE

NOW WITH THE NEW, MORE EFFICIENT CINCINNATI Hypro Dual Saddle Control and Precision Adjustment Handles

. . . it is possible to engage or disengage independently the feed or rapid traverse of any saddle or slide of either rail head from both ends of the rail from the head itself or from the opposite head. The slideably mounted precision adjustment handles provide accurate manual adjustment of tool point location of either head convenient to the operator's position at all times.



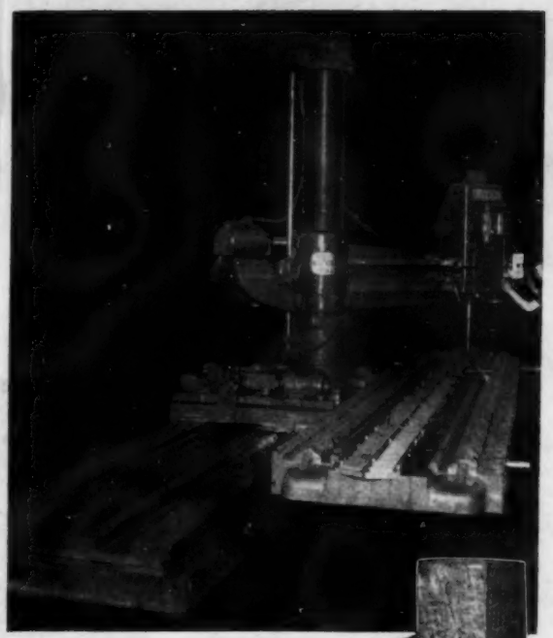
THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

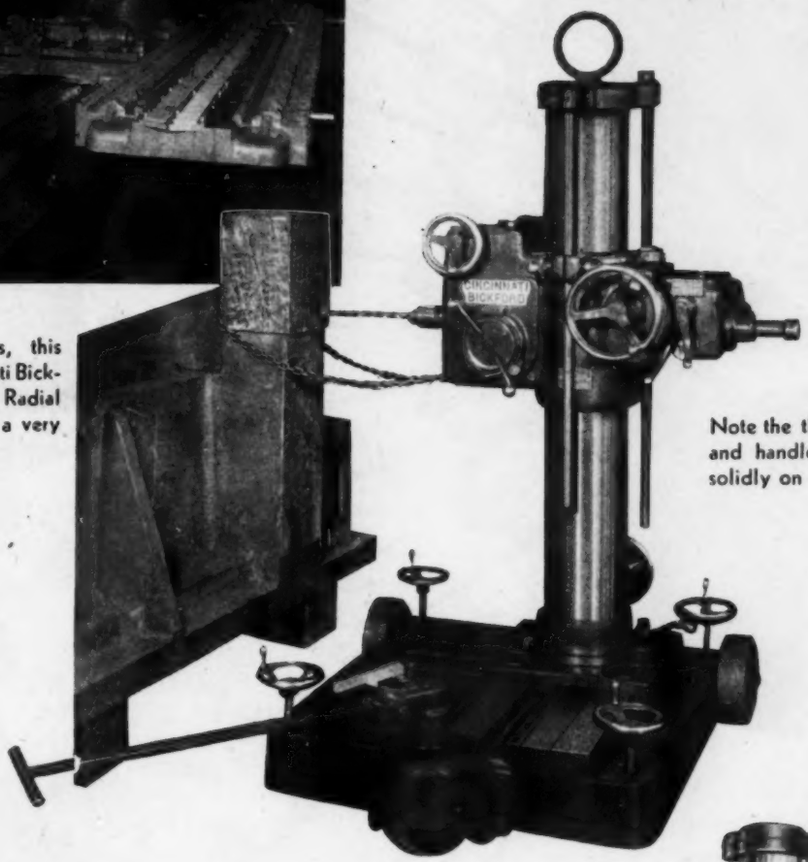
CINCINNATI, OHIO

Profitable Applications

of Traveling BICKFORD Radial Drills

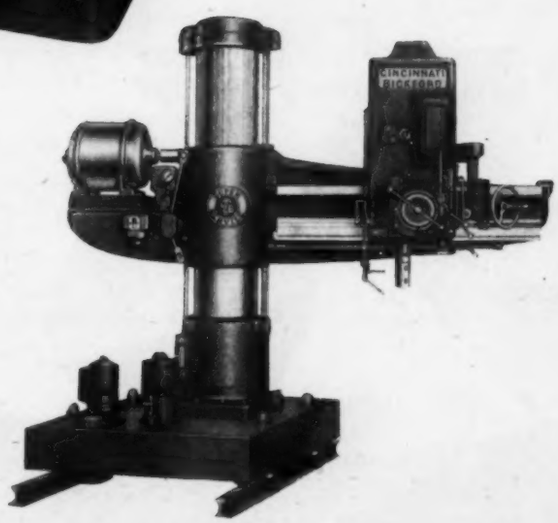


Mounted on ways, this sliding base Cincinnati Bickford Super Service Radial Drill is working on a very long casting.



Note the three-wheel base is easily moved and handled—in operation the base rests solidly on 4 leveling screws.

Moved by power, this track mounted Cincinnati Bickford Super Service Radial Drill has an unusually heavy base, rolling on hardened steel wheels.



When it is an advantage to move the drill to the work, Cincinnati Bickford Super Service Radial Drills, in various sizes and styles, are equipped for this service.

The "Portable Horizontal" is an inexpensive, 100% mobile machine, and offers great advantages on work within its range.

Powered with a 1½ horsepower motor, the base is equipped with leveling screws and built-in levels. Very handy; is easily rolled along the floor or moved by crane.

Large, cumbersome castings are being profitably handled by Cincinnati Bickford Super Service Radial Drills.

Write for Bulletin H-R, on the Horizontal Radial, or let us consult with you on your drilling problems on large castings.

See our Condensed Catalog in Sweet's File.

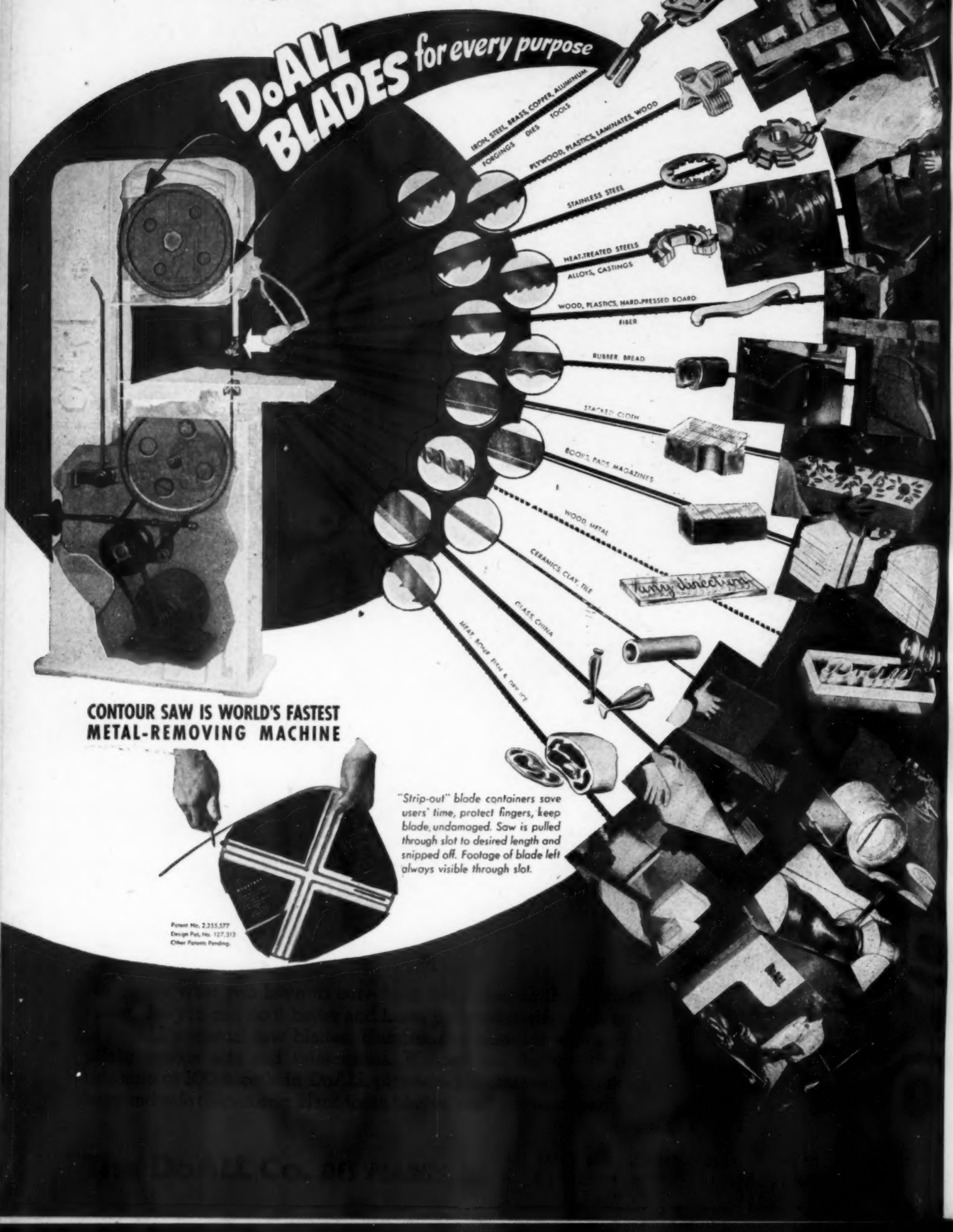
Equal Efficiency of Every Unit Makes the Balanced Machine.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

YOU CAN *Bandsaw* ANYTHING

DoALL BLADES *for every purpose*



CONTOUR SAW IS WORLD'S FASTEST METAL-REMOVING MACHINE

"Strip-out" blade containers save users' time, protect fingers, keep blade undamaged. Saw is pulled through slot to desired length and snipped off. Footage of blade left always visible through slot.

Patent No. 2,255,577
Design Pat. No. 127,313
Other Patents Pending.

American Machinist's Spot NEWS OF METALWORKING

Government "use controls" over at least four metals—tin, lead, antimony and cadmium—will be returned if the Marshall Plan is adopted by Congress. Washington metal experts explain lead is short the world over, tin and antimony production in the Orient is still very low and domestic cadmium supplies are insufficient to stand additional drains.

Test of the Contract Renegotiation law has been tentatively scheduled for November. The Supreme Court, which denied hearings on suits brought by two Detroit tool and die firms last June, has agreed to hear suits filed by three firms seeking relief from excess profits assessments levied against them under the law.

The new Federal Mediation and Conciliation Service will inject itself into only major labor disputes seriously affecting commerce. The motto of its chief, Cyrus S. Ching—"Play hard to get. They will like us more."

Soft spots are showing up within the gray iron foundry industry. Sharp cuts have been made into backlogs, and foundries handling foreign orders in the past are seeking new orders of necessity. On the other hand, malleable foundry production is resuming its high rate of activity after a summer slack off.

Continued rise in industrial activity through the late fall is predicted by Bureau of Labor Statistics Commissioner Ewan Clague. Non-agricultural employment of 42,558,000 in mid-August was a new 1947 peak. Yet, employment dropped in automobiles because of steel shortages and in electrical machinery because of declining orders.

Union officials may balk at signing non-Communist affidavits, but 1,112 unions have filed organizational and financial reports with the Labor Department. Both actions are necessary before unions can use NLRB machinery.

> **The Taft-Hartley Labor law has done a job of quieting labor. However, a storm is brewing. NLRB has extended to Oct. 31 the deadline for blanket dismissal of some 5,000 pending cases involving AFL and CIO affiliated unions if the non-Communist affidavits are not forthcoming from the parent organizations. By doing this, NLRB has put its deadline behind the conventions of the two labor organizations. Unless both conventions prevail upon their officers to comply on the affidavits, the NLRB is only delaying the day when it must uphold or reject the ruling of its general counsel, Robert N. Denham.**

A satisfactory supply of steel "within a relatively short time" for Pacific coast manufacturers has been predicted by J. Lester Perry, president of Columbia Steel Co. Citing the growth of Western steel production from a prewar 960,000 tons annually to a present capacity of 2 million 700 thousand tons, Mr. Perry anticipated an ample and even competitive supply very soon.

Pacific Northwest production of aluminum comprises one-third of the nation's producing capacity. Three major companies are now producing 487 million pounds annually.

The 27% freight rate increase proposed by American railroads now being considered by the Interstate Commerce Commission might well be doubled if wage and rule change demands by the five operating brotherhoods of trainmen are granted by the carriers. The brotherhoods are asking for a 30% wage increase and 44 rules changes. The wage increase would cost the roads $400 million yearly and the rules changes about $1 billion, according to rail officials. These two items would necessitate another 25% increase, they report.

(Further news on p. 145-152)

Teamed up for lower costs

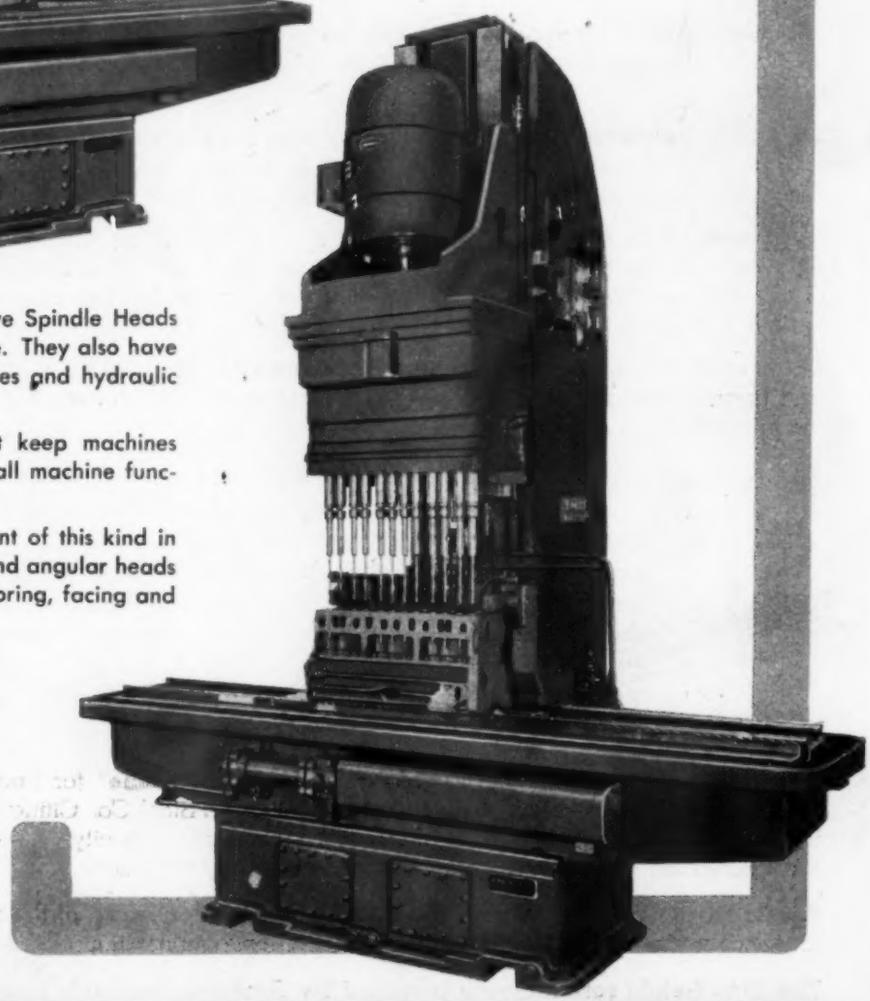
MORRIS MOR-SPEED

High Production Machines

● Illustrated are two Vertical Type Morris Mor-Speed, High Production Machines, which will operate as a team for reaming holes in automotive cylinder blocks.

The machine at the left is used for line reaming valve port, valve guide bushing hole and valve poppet hole. The head starts its feed at a high speed for the small diameter reaming and automatically changes to slow speed for reaming the valve port.

The machine directly below reams valve guides after they have been pressed into the block.



The machines are equipped with twelve Spindle Heads and a three position come-along device. They also have hydraulically operated clamping fixtures and hydraulic feed to Vertical Heads.

The operator has little to do except keep machines loaded and take care of the tools as all machine functions are automatic.

Morris builds high production equipment of this kind in various types with vertical, horizontal and angular heads for drilling, reaming, boring, counter-boring, facing and similar operations.

Morris has the engineering experience—the mechanical "know-how"—the facilities to design—develop—and build high production machines to meet your specific needs. Consult them on your mass production jobs or ask for the Morris Production Machines booklet showing examples of different types of machines for various operations.

Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

TIME TO SELL

The Machine Tool Show was proof positive that our metalworking industries should not be wedded to old techniques.

Nothing like this show ever before happened to the machine tool industry. The attendance in itself was overwhelming.

Over 175,000 people poured through the gates of the Dodge-Chicago plant in nine days to see new and better ways of machining metal products.

The show demonstrated many things. It proved the costliness of keeping old machines in operation when better ones are available.

It proved that costs can be cut, despite all-time high labor rates.

It proved that productivity per manhour can be further increased, even if employees will not work any harder than they do now.

It proved that government surplus machines are as outmoded as Ford's model A.

It proved that metalworking men by the tens of thousands have an extraordinary interest in replacing their old equipment with new.

But even with this astonishing evidence of prospective business, machine tool builders should not relax. By contrast, they now should exert every possible sales effort to convert those prospects into firm orders.

Interest in new machine tools has been raised to white heat by the show. The amount of business flowing from the show promises to be tremendous. And it promises to last over a period of many months.

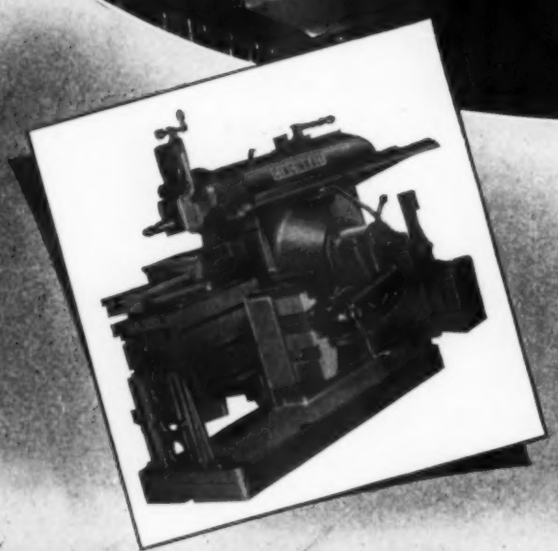
But that will be true only if the selling staffs of machine tool builders and of their distributors go out and close the orders.

Now is the time to sell. Upon the intensity and enthusiasm of its selling efforts will depend much of the industry's future prosperity.

Burnham Finney

EDITOR

THEY ARE dependable-



They never stop—fair weather or foul—day and night the iron horse rolls, delivering the goods of a nation—they are dependable.

Behind the scenes, men and machines work to keep the iron horse healthy.

Cincinnati Shapers—rugged, sturdy and versatile—work in Railroad Shops from coast to coast—they are dependable.

Write for Complete Shaper Catalog N-3.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

PRACTICAL DESIGN OF THIN-METAL STAMPINGS...I

BY WALLACE C. MILLS, Rockford, Ill.

Design can save production many headaches and tool troubles by presenting thin-metal designs practical for manufacturing

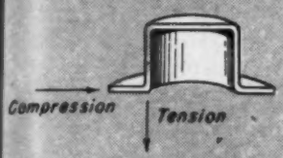
NEW PRODUCT DESIGNS invariably confront design and production engineers with these questions: Is the design practical for manufacturing? If not, what can be done?

To both design and production engineer, understanding of certain conceptions about forming thin metal are helpful. Knowing how the metal acts differently from heavier stock, what to avoid with the reasons thereof, alternative structures, kinks about metal forming and details of construction—all help in establishing the final design.

The do's and don'ts are special, because, in the first place, thin metal tears and wrinkles more easily than does heavier stock. While heavy stock can be press-formed in dies that would not do for thin metal, thin stock can be joined in pieced structure by seams. Moreover, in thin-metal design, attention must usually be given to ways of covering cut edges because they are thin and sharp.

Secondary operations, such as curling and thread rolling, are of frequent occurrence on light stampings. Because these operations are performed on the periphery of the work after it has been blanked, progressive dies are less common and methods of transferring stampings from one machine to another, or from one die to another in the same press, are highly developed.

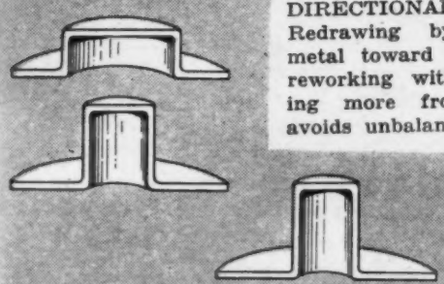
Stampings can be blown through chutes by compressed air from the first blanking and drawing press to other presses in line, and can be located over dies by special feeding devices. In other cases, they can be transferred



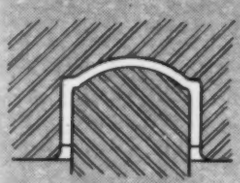
DRAWING FORCES—tension and compression combine, in drawing, to flow the metal without rupture as diameter is decreased, drawing to shell form

DEEP DRAWING—Depth of draw determines the number of operations. Depth of twice diameter would require three draws

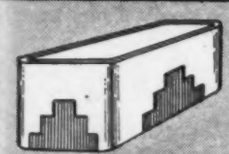
REVERSE DRAWING—Drawing inside out allows greater depth of draw and is easier on stock than single- or double-action drawing



DIRECTIONAL FLOW—Redrawing by drawing metal toward center and reworking without drawing more from outside avoids unbalanced tension



SETTING THIN METAL—Striking hard between dies removes flat spots, prevents spring-back but requires design that allows insertion of tool inside



LITHOGRAPHING—Rectangular shells should be lithographed only where there is no severe metal flow

POLISHING — Products, plated and polished, should have no crevice where a buff cannot reach. Preferred style for a flashlight lens ring is curled only

from one die to another in the same press by automatic feeding devices. The technique of manufacturing is closely related to methods of can-making.

The can-manufacturing technique is economical, as it saves in cost of material. Sheet-steel stock, purchased in 24x30-in. sheets, usually but not always costs less than coil stock, even after it is slit into strips. Also, there is less material wasted in blanks for several pieces of a structure than there would be in a blank for an integral structure.

A tin can costs less than a drawing shell. Deep-drawing operations are slow and there are greasing and degreasing operations. If decorated, deep shells must be sprayed after fabricating, but can bodies and the shallow draws of can ends can be made from stock lithographed in flat sheets. If tin-can appearance is objectionable, there are ways of improving appearance at greater cost. Other structures, not cans but similar in that they are made of thin metal, can be manufactured by the same technique.

Types of Stampings

Visualizing what can be done in forming of thin metal is aided by considering the different kinds of stampings and what happens in forming. Thin metal can be stretched slightly without tearing and compressed very slightly without wrinkling.

As in sheet-metal working, it can be perforated, bent, folded, corrugated, seamed, indented, beaded, curled, and slightly stretched. These processes are too well known to require description. It can be formed by spinning if the metal is soft and thick enough, but the spinning process is limited to soft metals.

Thin metal can be drawn. In drawing, the metal is worked in compression laterally because it contracts from a larger diameter to a smaller diameter, but the compression is balanced by a drawing tension applied vertically. The two forces combine to shift the metal without excessive strain which would rupture it. But during drawing, thin stock must be confined closely in dies to avoid wrinkling.

If too much drawing is attempted in one operation, the forces can become excessive and rupture the stock. Drawing deep shells, of depth equal to twice the diameter, is practical, but three operations are required. In the first operation, the shell is drawn in from the outside as far as is practical and then it is reworked gradually. Stampings that have been drawn cup shaped can be turned inside out just as a rubber structure could be indented or turned inside out without much stretching.

Many redrawing operations are performed by first drawing in metal from the periphery of the blank and then reworking the hump without drawing more from the periphery. This avoids unbalanced tension.

Another principle, much used, is to strike hard between die surfaces to set thin metal. The metal in the dome is bumped hard to take out flat spots. In other cases, as in bending, striking hard avoids springback. In order that the metal can be struck hard, the structure must be designed so it is possible to get a tool inside it.

Decorating and Plating

Shallow-drawn structures are lithographed or coated in sheets, about 24 x 30 in., which are slit into strips afterwards and run through punch presses. The elasticity of the coating is sufficient for press working. Lubrication is not a difficult problem because the stock

INDUSTRIAL DESIGN

BY KEN UNTER, Industrial Designer

DESIGNS are changing constantly, so the industrial designer must be on the alert and ahead if possible of current style changes. In designing one should try to make the product as beautiful as possible and still keep it practical to manufacture. It is important, therefore, to have close cooperation with the chief tool designer on structural-design problems.

Three factors influence structural design:

1. *Design Safety*—The item must not only look safe but actually be safe, even for children to handle. It should have no sharp corners or exposed edges, and be convenient in size to handle and not too large to fit the hand nicely.

2. *Design Cleanliness*—Ridges, folds or deep recesses which catch dirt and render the item hard to clean should be avoided. Contours should be kept smooth with only an occasional ridge or indentation to strengthen or beautify the product. Bottoms can be recessed slightly to fit convex cover or tops for shelf stacking. Nesting items, such as canisters to fit inside each other, will save on shipping space.

3. *Design appearance*—First of all the product must have good balance and proportion. It should not appear top-heavy if it is designed for a vertical position nor should it be heavy on one end in a horizontal position. The finished product when assembled should not look cheap but well finished and rich in appearance.

Art design of a product gives "sales appeal," but size of product limits the amount of art design possible. Large sizes permit the use of more color with larger and more legible type and design. Important are placement, distortion effect and color:

1. *Design and Decorating Placement*—Large flat surfaces, visible and not distorted by metal drawing, are favored for art design. Decorating must be kept away from the top of some containers because of chemicals that are likely to smear or dissolve the decorating.

2. *Distortion Effect of Decorating*—Decorating must be spaced at a safe distance from areas of metal distortion by keeping away from square corners and avoiding parallel lines and horizontal lettering running around a square box. Round boxes are distorted too. Distortion of metal and thinning out of decorating increases with the depth of draw. Decorating loses its punch with deep drawing.

3. *Color*—Type of product influences the color of a package. Color should be used to catch the eye, create a desire to buy and to express the quality of the product. The success or failure of a package can be the direct result of the manner in which colors are used. The following color suggestions indicate how much thought and care should be taken in color selection for successful packaging:

(a) Medical packages—must be clean in appearance with light backgrounds.

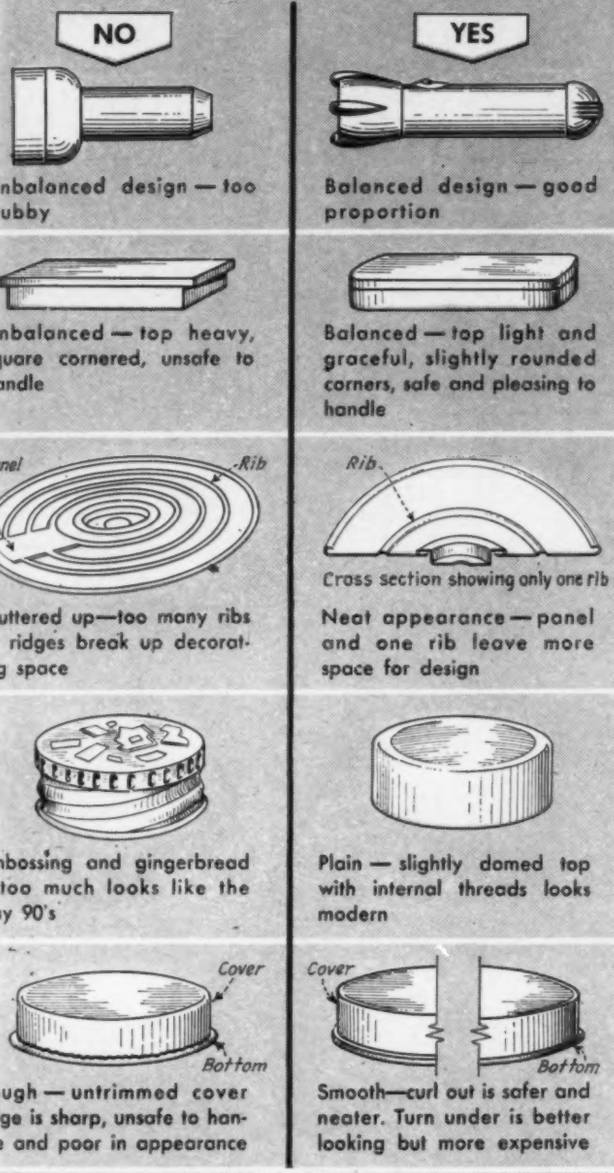
(b) Condiment packages—warm colors with red or orange for pepper and spices.

(c) Children's school boxes—bright primary colors of yellows, reds and blues.

(d) Kitchen canisters—clean, cheerful background with a touch of red.

(e) Face-powder boxes—soft pastel shades (pinks, greens and blues) with gold and silver used to give richness and sparkle.

Structural Design For Safety, Cleanliness And Appearance


NO
YES
Unbalanced design — too stubby
Balanced design — good proportion
Unbalanced — top heavy, square cornered, unsafe to handle
Balanced — top light and graceful, slightly rounded corners, safe and pleasing to handle
Panel
Rib
Cluttered up—too many ribs or ridges break up decorating space
Rib
Cross section showing only one rib
Neat appearance — panel and one rib leave more space for design
Embossing and gingerbread —too much looks like the gay 90's
Plain — slightly domed top with internal threads looks modern
Cover
Bottom
Rough — untrimmed cover edge is sharp, unsafe to handle and poor in appearance
Cover
Bottom
Smooth—curl out is safer and neater. Turn under is better looking but more expensive
Stop design below bead
Flat surface usable for decorating
Stop decorating here, just high enough to be covered by top
Bead
Chalk Box
Hand Cleaner Can
Square Pill Box Body
Typewriter Box
Distorted by metal
Correct design
Slight distortion from drawing
Greater distortion

ART DESIGN — decorating must be spaced away from areas of metal flow. Preferred are large, flat surfaces. Unpreferred are square corners and parallel lines and horizontal lettering running around a square box. Deep draws make decorating less effective

is worked back and forth without ironing. Lubricants, which dry without degreasing, may be applied by spraying liquid wax, as in the case of lithographed paper, or by rubbing with chunks of paraffin or by rags moistened with petrolatum.

Lithographed designs are laid out by running checker cross-sectional stock through dies and correcting for distortion.

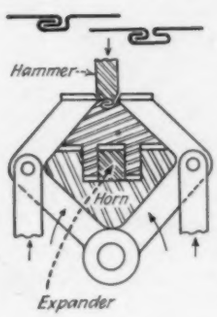
Deep-drawn structures are coated by spraying after fabrication. The surface of the metal is broken by the deep drawing. If decorating were done in the flat sheet, the coating would be cracked and thinned out and rust spots would later develop. Deep drawing requires lubricants that must be degreased or wiped.

Rectangular deep-drawn shells can be lithographed on sides but not on corners where severe drawing occurs.

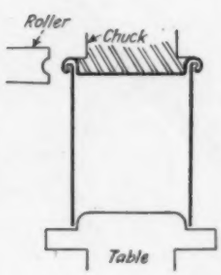
Welded structures require spraying or touching up at the welded spots to avoid rust. Welding is favored for heavy metal to avoid thick seams.

Plating, rustproofing and immersion treatments are helped by drain holes because it is hard to get all the liquid out of cups. When plating is followed by polishing, crevices that cannnot be touched by a buffing wheel should be avoided.

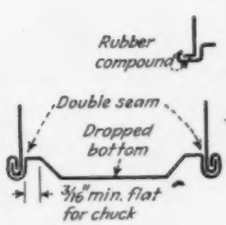
DESIGN HINTS ON CANS



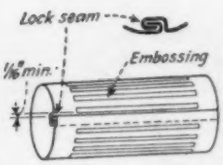
Can Bodies—made in can-body makers at speeds from 90 to 300 per min. Side seams are single lock or double lock. Double lock resists crushing but requires delicate tools and is limited to 0.012-in. max. thickness. Seams may be inside or outside of can. Side seams for rectangular cans should be at the corners, not in the middle of a flat side, because the forming wings of a can-body maker swing on a pivot



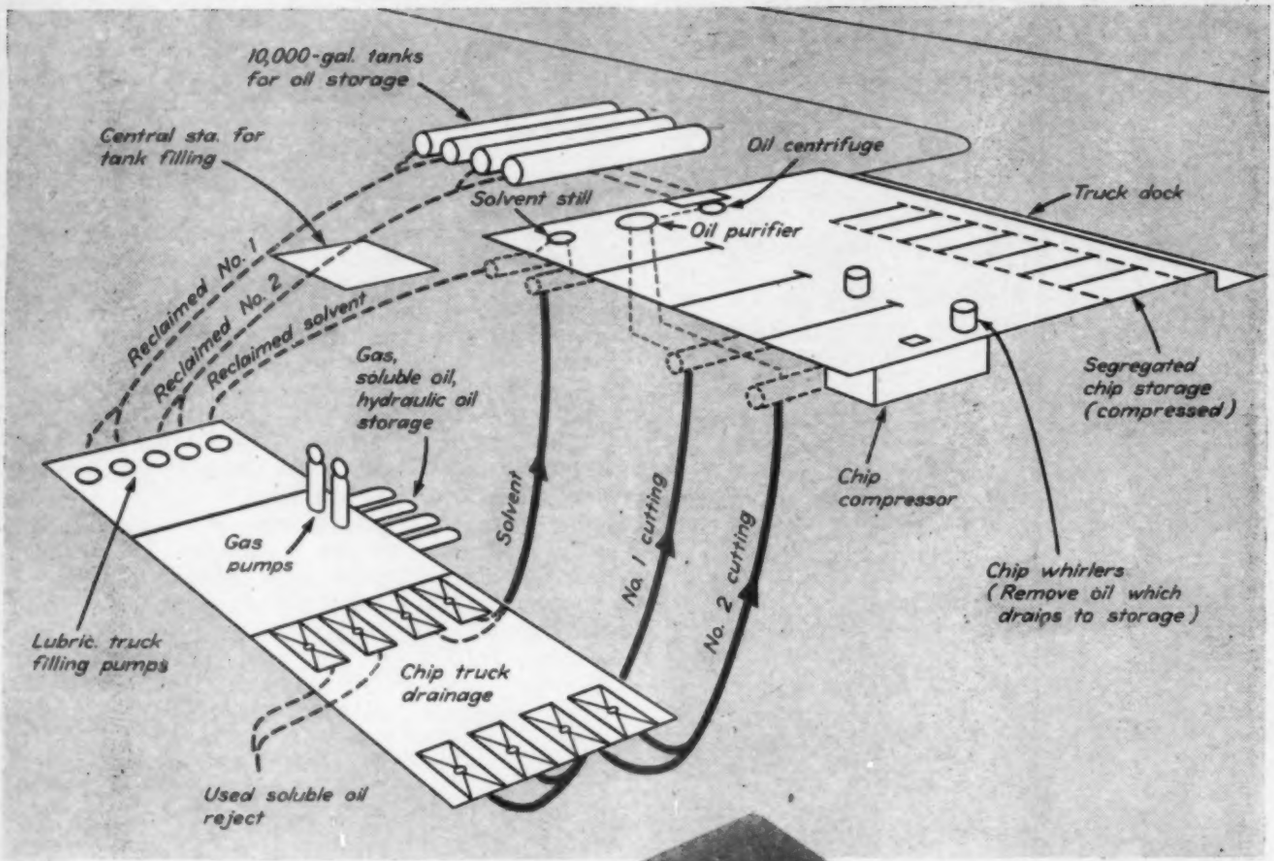
Can Corners—rounded corners are preferred because ends are seamed on by rolling and sharp corners are hard to roll. Seaming gives cans their characteristic appearance, because it is done over a chuck which enters the can end from the outside rather than over a plug on the inside—a slower method. Rolled seams are less accurate than die-formed joints and should not be used for fits



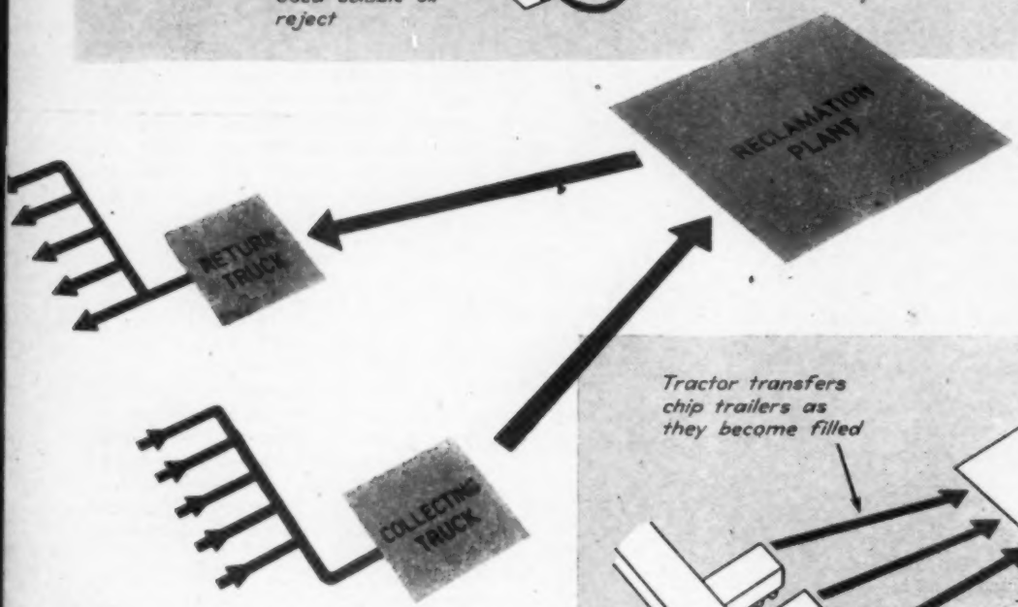
Double Seams—used for cans larger than 3 in. dia. and for heavy products to avoid tearing off the bottom, double seams require notching of blank and flanging of formed body before seaming. Seams may be rendered air-tight by rubber compound applied before seaming. Body blank must be notched before hemming or curling



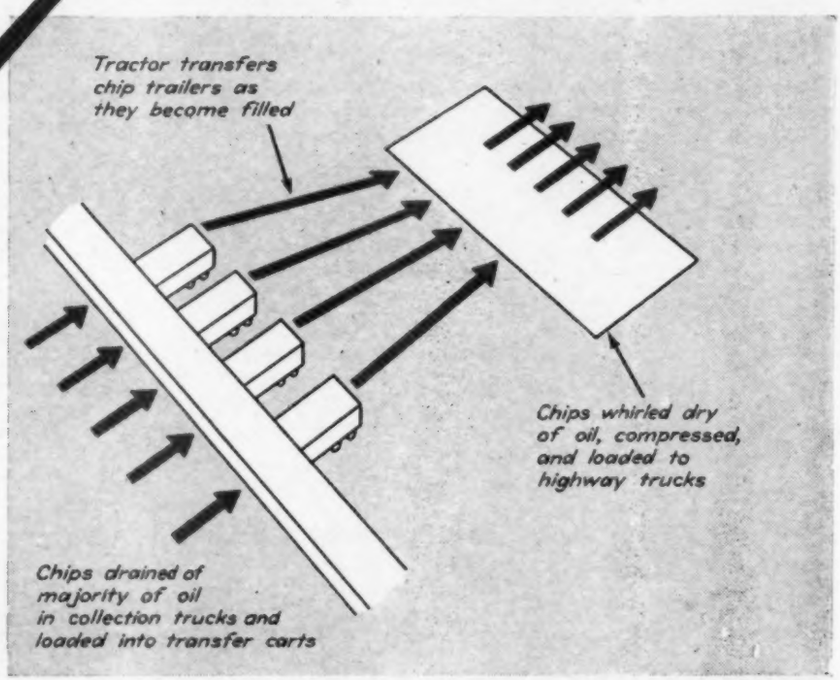
Embossing—flashlight-tube embossing should be kept away from the lock seam to avoid flattening the embossing when the seam is bumped tight. Keep decorating from the seam to permit soldering



Main plant consists of storage tanks and pumps, plus an oil house including chip whirlers, chip compressors, chip storage, solvent still, oil purifier and oil centrifuge



Reclamation cycle handles about 250 gph. Oil is unloaded from machines, by collecting trucks, taken to underground tanks at the reclamation plant. Cleaned oil is returned by trucks to machines as required by production


Tractor transfers chip trailers as they become filled
Chips whirled dry of oil, compressed, and loaded to highway trucks
Chips drained of majority of oil in collection trucks and loaded into transfer carts

Chips are brought in by trucks to an unloading dock. There they are transferred to carts taken by tractor as filled to the chip whirlers. Dry chips are compressed and loaded into highway trucks

GOOD LAYOUT MAKES OIL RECLAMATION PAY

Batch reclamation of cutting oil can return useful oil to machines on almost continuous basis with adequate tank facilities and purifying units

LAYOUT AND DESIGN of oil-reclamation systems and chip-recovery facilities is extremely important, particularly where it is not automatic and continuous. The Parker Appliance Company, Cleveland, has put its oil-reclamation program on an efficient basis by good engineering. Four central 10,000-gal. tanks supply all machine tools including screw machines, automatics and multiple-spindle units, with clean cutting oil at all times.

Two grades of cutting oils meet the requirements of the machines on steel, aluminum and copper alloys. Under the present system Parker recovers better than 61% of its cutting oil. In addition to this, though less measurable, is the real benefit that follows as a result of workmen having a practically unlimited amount of cutting oil at their disposal.

As soon as the oil salvage system was installed there was an increase of 46% in the total amount of oil used in the plant, and machinists were not tempted to use cutting oil whose efficiency had been spoiled by being left in use too long. Another advantage was a marked decrease in dermatitis because of the relatively clean and sterilized oil.

At the shipping side of the main plant, a collecting and drainage station was installed. Here, oil to be reclaimed is dumped from collecting trucks to underground tanks, from whence it is piped across to the oil-purification building. Two tanks are also available for oil that is rejected as being beyond reclamation. Cutting oil is drained every two weeks.

When the cutting oil is piped across to the Oil House, it enters an open tank equipped with baffles. From this tank the oil is taken to storage tanks for dirty oil, located on the floor below. Dirty oil is then pumped through the cone-bottom sterilizing tank, where it is heated to approximately 185 F. and held at this temperature for a few hours. This sterilizes the oil and gives the metallic particles a chance to settle out.

Sterilized oil is then passed through the commercial oil purifier of the centrifugal type and fine particles of metallic sediment and any water that has not been settled is removed by centrifugal force. The purifier continously discharges the purified oil to a storage and receiving tank in the basement where it is blended with new oil.

Chip Oil Extraction

When production is high enough and there are a sufficient number of chips coming through, they are loaded in chip trailers at the main plant siding and transferred to the Oil House by tractor. Here they are put in extractors and the oil removed by centrifugal force and collected in a holding tank. Chips are compressed and loaded onto trucks for shipment. Compressed chips may be stored until a sufficient quantity has been gathered for economical shipping.

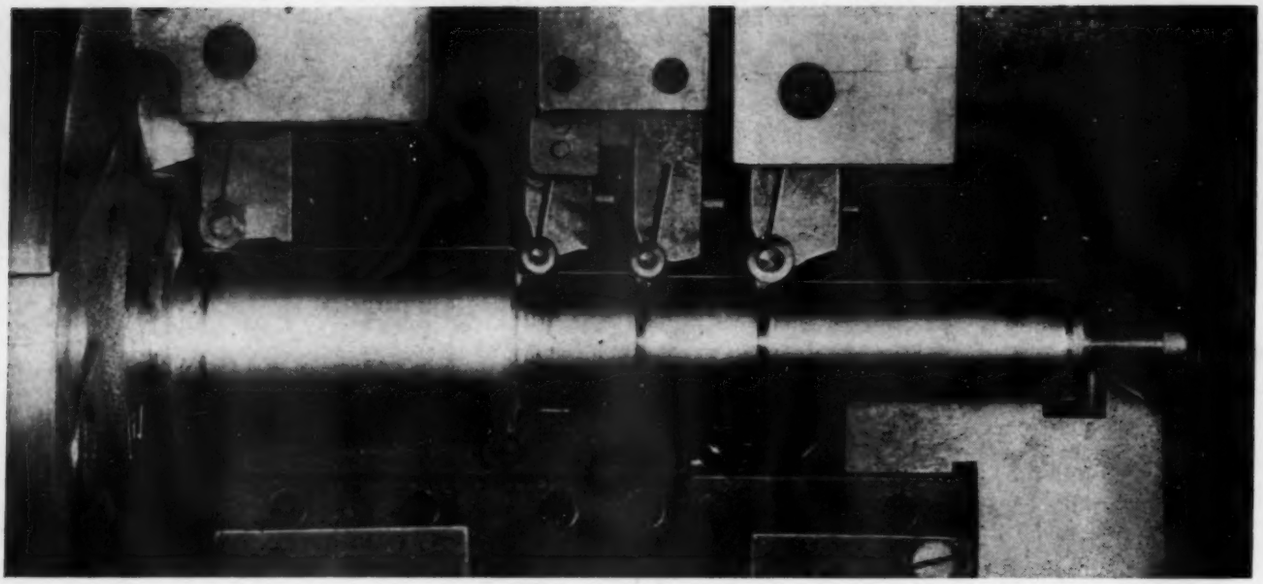
Reclaiming rate with this system is about 250 gph. Supply in the 10,000-gal. tank determines to some extent the frequency with which the oil is reclaimed in batches in the Oil House. Quite often, a reclaiming time of 6 hr. a week will meet plant requirements. It is most economical to run reclaiming lots of at least 500 gallons.

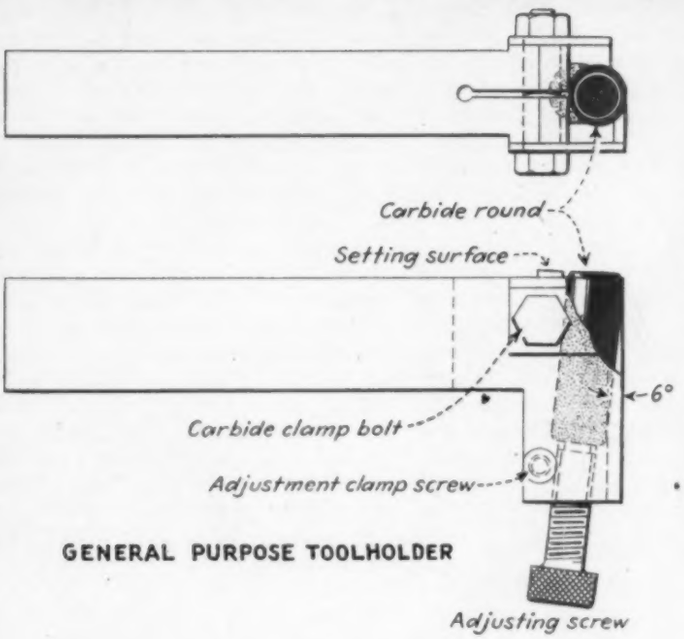
Parker engineers paid considerable attention to details in connection with their oil-reclamation system. Positive displacement meters are used everywhere in the plant, enabling each department to know exactly how much oil is being used, therefore to keep its cost records up-to-date at all times.

Piping between the machine shop floor and the Oil House is equipped with the type of check valves used by gasoline stations and oil refineries but seldom seen in the average metalworking plant. If a check valve pits or scores and must be removed, the work can be done from the ground level by removing two caps from the suction line, unscrewing the valve assembly and removing it for replacement and cleaning. This takes about 10 min.

Machine sumps are completely cleaned out and washed every six months unless jobs are changed too frequently or a shift is made from one metal to another. Should trouble occur too frequently, the machine is immediately cleaned out and fresh oil charged to the operation.

In normal peacetime production, four chip men adequately handle the system. On the floor there is one man to every 40 machines for pick-up and delivery to the collecting tanks. When chip recovery is active, this personnel must be supplemented by two or three additional men. Where oil is heavily charged with water, a man must go below every morning to drain the tanks below the floor of the Oil House. Proper equipment and a good layout puts batch reclamation on a paying basis with a minimum of manhours expended.





GENERAL PURPOSE TOOLHOLDER

LONGER RUNS BETWEEN TOOL CHANGES are made possible because *each* end face of the carbide round provides five to six cutting edges in succession. Tools in prototype lathe (photo) removed 1 lb. 10 oz. of metal from rear-drive pinion forging in 15 sec., at 7/32 in. depth of cut and 0.040 in. feed. Since this photograph was made, round, square and triangular tools have been applied to the two slides. More than 1300 pieces have been produced without repositioning the tools in the toolholders

ROUND CARBIDE TOOLBIT

Diam.	Length
1/4	1 1/2
5/16	1 1/2
3/8	1 1/2
1/2	1 1/2

Why Buick Uses

CLAMP TOOLHOLDERS FOR CARBIDE SHAPES

Rounds, squares, triangles are easily reset and reground—save dollars in 7 ways. The Flint plant has more than 100 setups on various multiple-cut gear jobs

BY RUPERT LE GRAND
Associate Editor

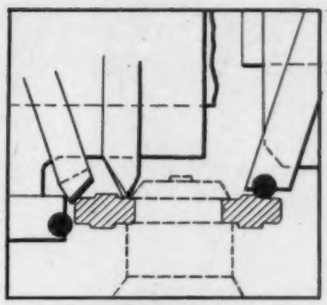
THE IDEA is fundamentally simple. The edges of a cylinder should cut if properly presented to the work. By tilting the cylinder for top rake, the effect is a round-nose tool. And the economy of a cylinder has interesting possibilities.

Solid carbide round, square and triangular tools are easily reset and reground, and the Buick Division of General Motors at Flint, Mich., offers proof of it on various multiple-cut gear jobs.

Advantages from the new arrangement are:

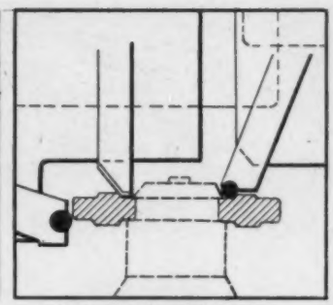
1. *Longer runs between tool changes.* Each end of the carbide shape—round, square or triangle—gives several cutting edges. When one portion of the edge is worn, the tool is turned to a new position. After one end is completely dull, the

ROUND CARBIDE TOOLBITS are used where there is sufficient clearance for the toolholders; otherwise conventional carbide-tipped tools are retained. Tooling layout (above) for a second-operation, double-indexing Bullard for the low and reverse gear, shows the method;



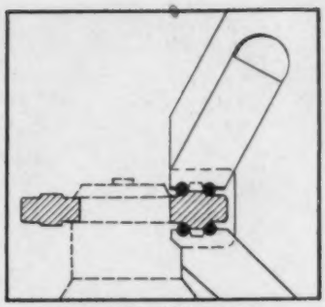
3RD AND 4TH STATIONS

Two round tools—one rough faces one-half the blank, the other rough turns the O.D.



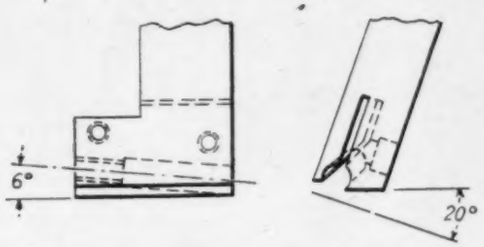
5TH AND 6TH STATIONS

One round toolbit finish turns the O.D. and another toolbit rough faces the second half.



7TH AND 8TH STATIONS

Two straddle facing toolholders, (see photo) finish face two thicknesses of the blank



To clear the work clamp, the right-hand toolholder at stations 5 and 6 is made so that the carbide bit is "hung" on the corner

carbide bit is turned end for end to get a like number of cutting edges. Total time to reset a tool to a sharp edge and resume production of parts to gage limits is very fast.

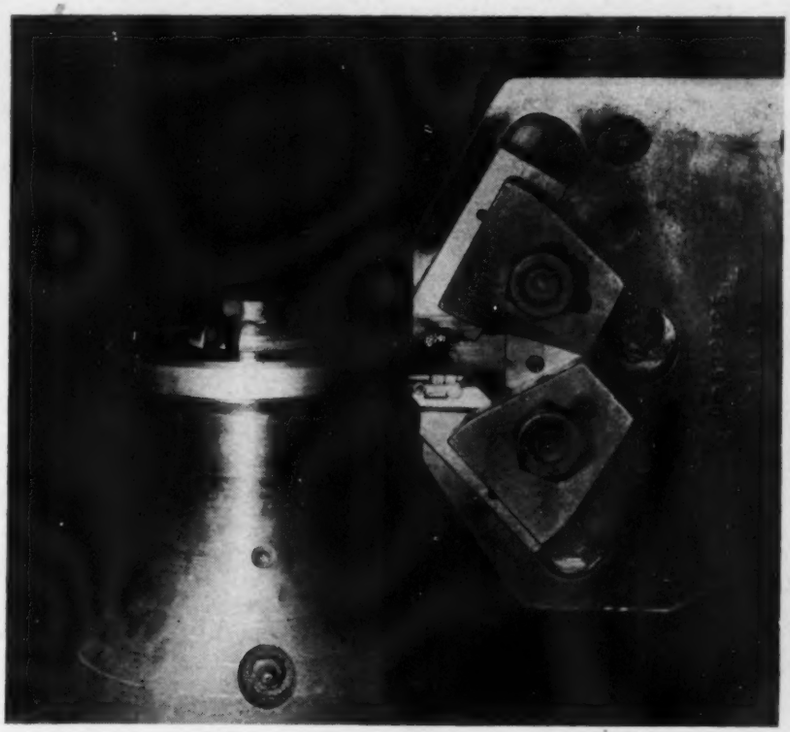
2. *Time to change tools is reduced.* Merely back off one screw, replace worn tool with a sharp one, adjust the backup screw so that the top surface of tool is flush with the gaging surface, and tighten the clamp screw. The toolholder is not touched once it is properly positioned on the machine for the job in hand.

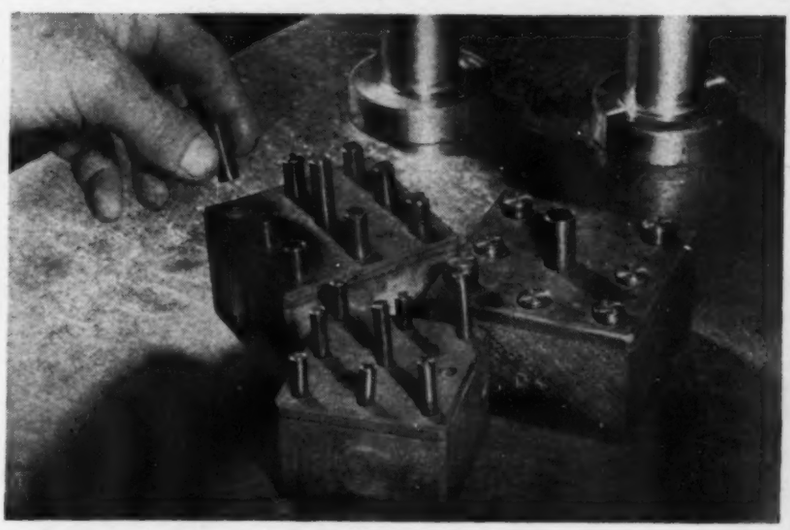
3. *Negative rake is enjoyed.* Toolholders for both iron and steel jobs are bored or broached so that the end of the bit is tilted 6° to the work, giving the effect of negative rake. Downward pressure on the tool prevents it from lifting, even if the operator forgets to tighten the clamp screw.

4. *Regrinding time is shorter.* Both ends can be squared off and a chipbreaker ground quickly. Grinding setups are simple. Cast-iron tools are slightly dished on the cutting face.

5. *Scrap has been reduced.* Carbide tools stay sharp longer. There is no disinclination to reset tools as needed, because the task requires little time and effort.

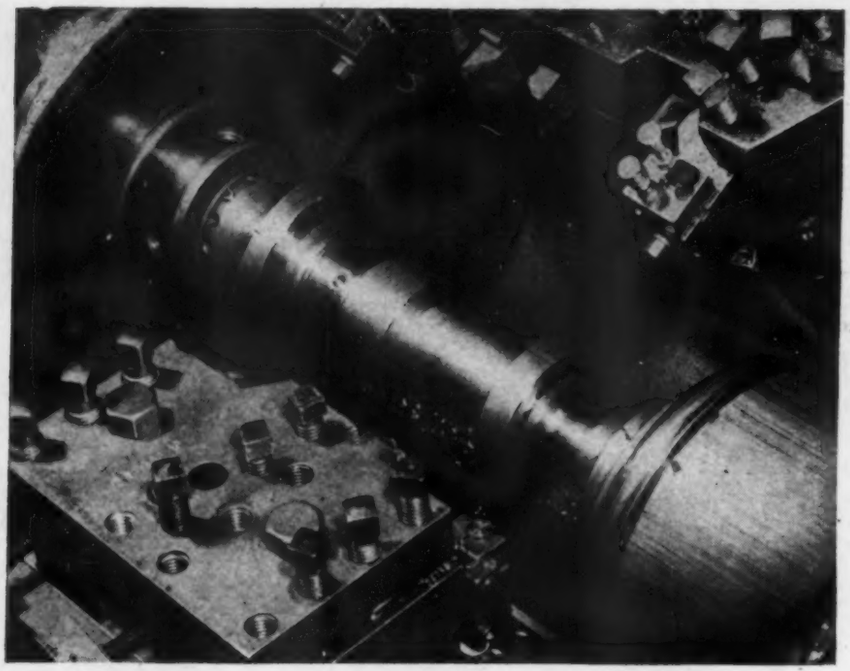
6. *No carbide is wasted.* Approximately

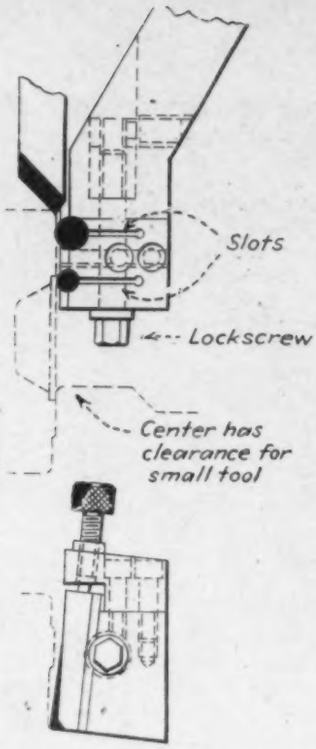




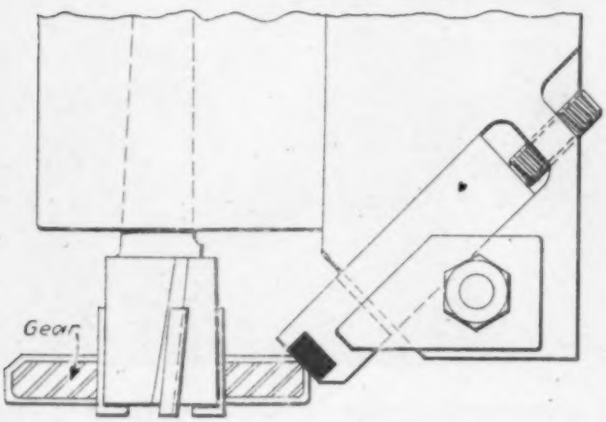
Reground toolbits are issued in wood receptacles stamped with the tool number involved. Grade of carbide is lettered on box and etched on toolbit. System simplifies stock problems

CLAMP TOOLHOLDERS FOR CARBIDE SHAPES



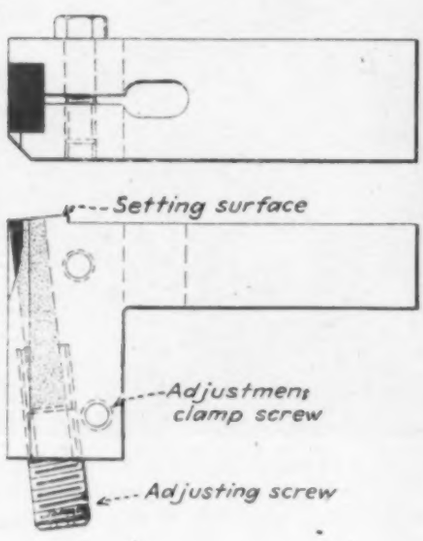


Two round toolbits, ¼ and ⅜ in. diam., are combined in one clamp toolholder for facing the thrust bearing and the over-all length of the counter gear. Experience shows that the smaller tool does not dull first, because the area of contact is smaller. Right- and left-hand toolholders are used on the two ends of the piece



Chamfers are cut with square carbide tools.

At the 3rd and 4th stations of a double-indexing Bullard for the first and reverse gear, it is now possible to combine chamfering and reaming. The ⅝ x ⅝ x 2 in. tool is held in the toolholder by a slot and pinch bolt. Square tools give eight cutting edges, four per end



Tools are saved too. On a Bullard, at Station 2 the left-hand head turns a 9° taper on the second-speed gear, while the right-hand head with two tools faces the end and the flange. With high-speed steel tools, the facing cuts were made only halfway at this station and completed at the next, whereas the right-hand head is now idle at Station 3

two-thirds of the shape can be devoted to regrinding. When no longer serviceable in the toolholder, the carbide bit can be brazed to a steel shank and turned to original diameter and length, replaced in holder and all carbide used.

7. *Tool control is simplified.* Unlike previous practice, tools for a specific job need not bear a tool number and be ground to specific rakes and clearances by the crib. Facts about the tools for a specific job and machine are recorded on cards. Data cover tool diameter, chip breaker radius, grade of carbide. Any toolbit of usable length which satisfies these three requirements will fill the bill. Sets of tools are put in small wood box and issued to the shop. Stocking is merely a matter of keeping on hand an ample supply of toolbits in the few standard sizes.

Toolholder Often Modified

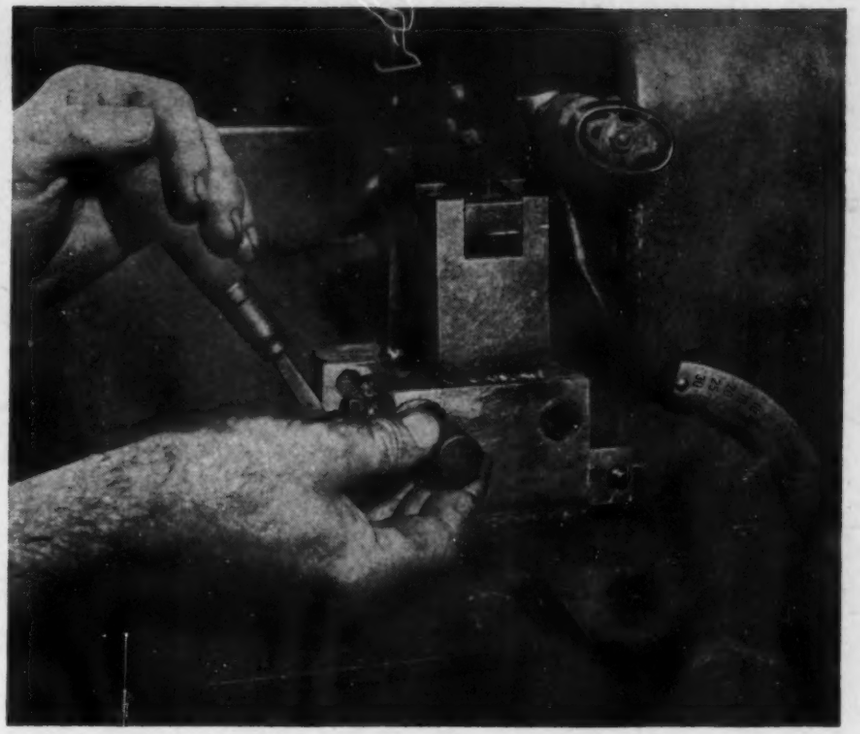
In practice, the position of the carbide shape in the toolholder is modified to suit conditions. In fact, the tool can be "hung" on the corner, when it is necessary to obtain clearance because of chuck or work-body interference. The pressure of the cut is down and backward in the body of the toolholder, and there will usually be enough metal to secure the lower end of the tool and provide room for the back-up, or adjusting, screw.

The carbide shape is chosen according to the nature of the operation. Round toolbits are used for turning and facing operations. They may be followed by triangular-shaped toolbits to clean up the corner, if there is room for the toolholder. Otherwise, a conventional single-point tool is retained. Square or rectangular toolbits are employed for chamfering.

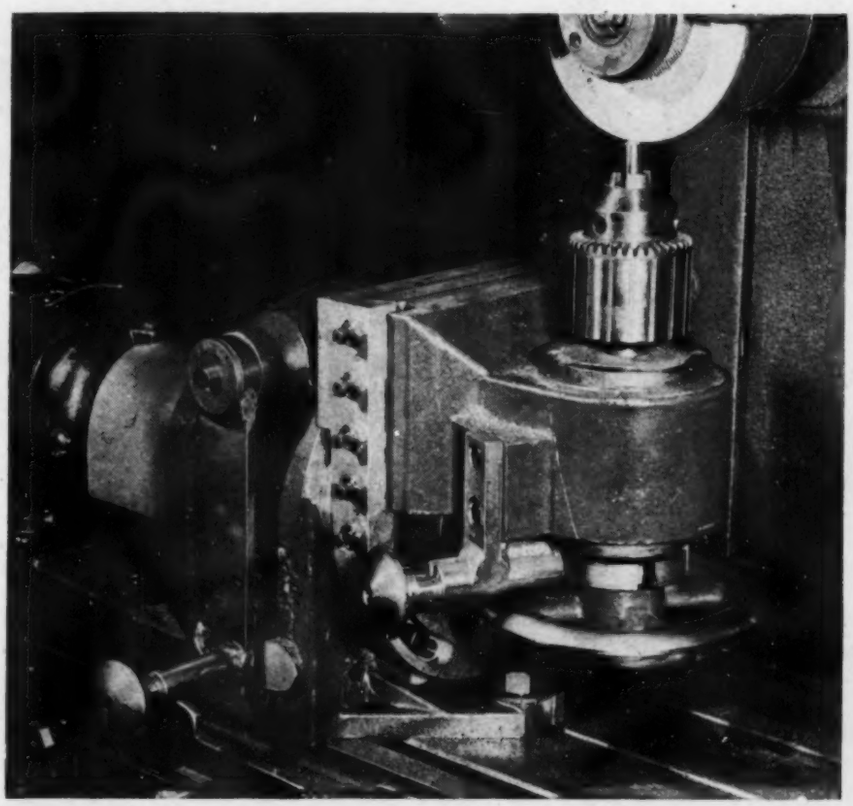
Number of Positions

The number of times the tool can be repositioned in the toolholder depends on the shape. Rounds can be repositioned five to six times before the peripheral cutting edge is entirely dulled. Squares can be repositioned four times; triangular-shaped tools, three times. And by turning the tool end for end, the number of repositionings is doubled before the tool must be reground.

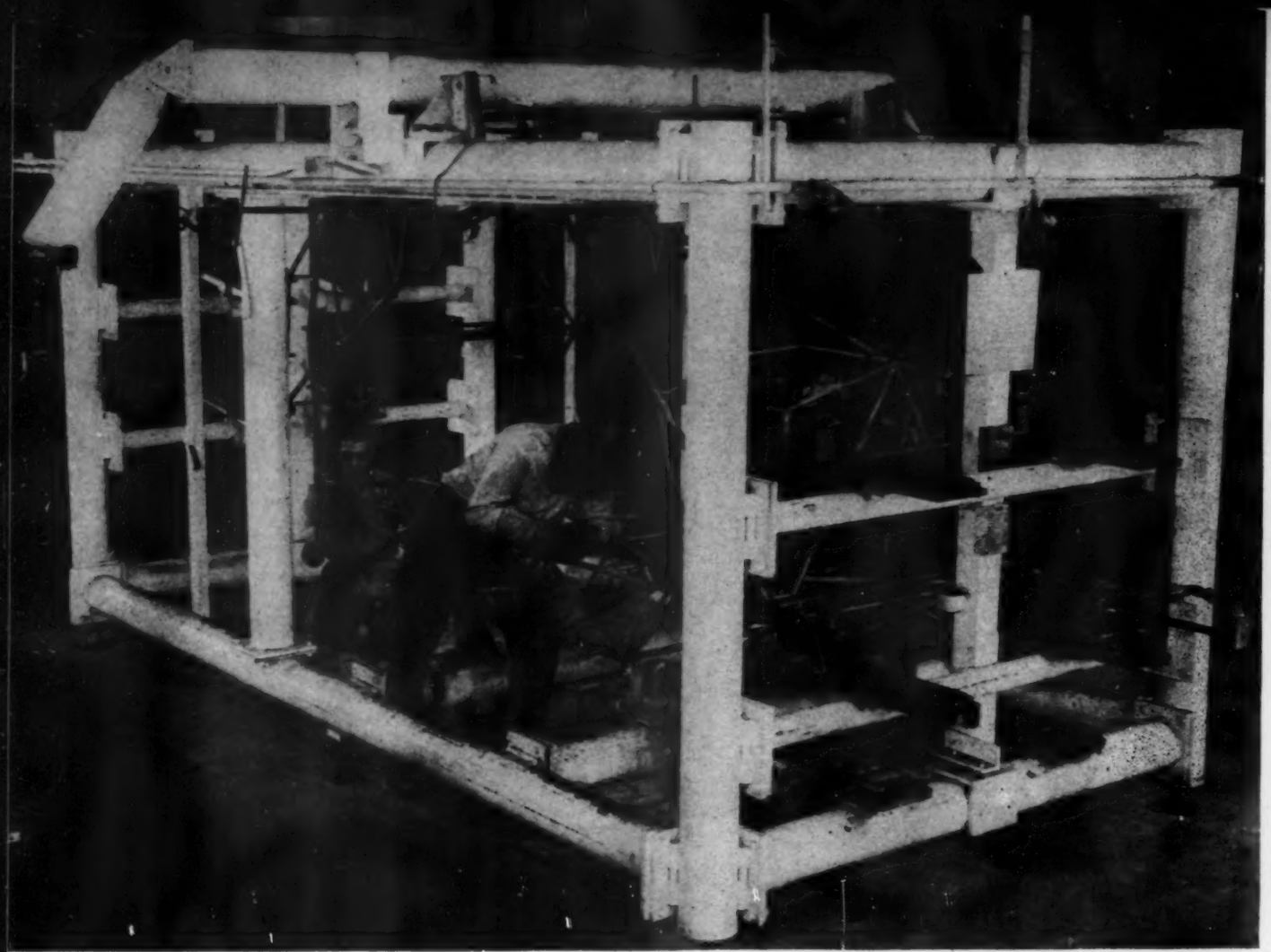
Carbide manufacturers are stocking toolholders and carbide shapes in various sizes.



Rough grinding of dull round toolbits consists of squaring the ends. First, the round is clamped in a block, which is inserted in the swinging arm of the fixture. Next, the toolbit is cam fed against the side of the green wheel by pulling back on the fixture handle



For finish grinding, the squared toolbit is placed in a key-type chuck, which is driven at proper speed by a motor connected to the fixture. To dish the end of the tool for machining cast iron, the fixture is tilted. If the tool is intended for steel, the diamond wheel is fed down on the edge of the revolving tool to grind a chip breaker, as shown

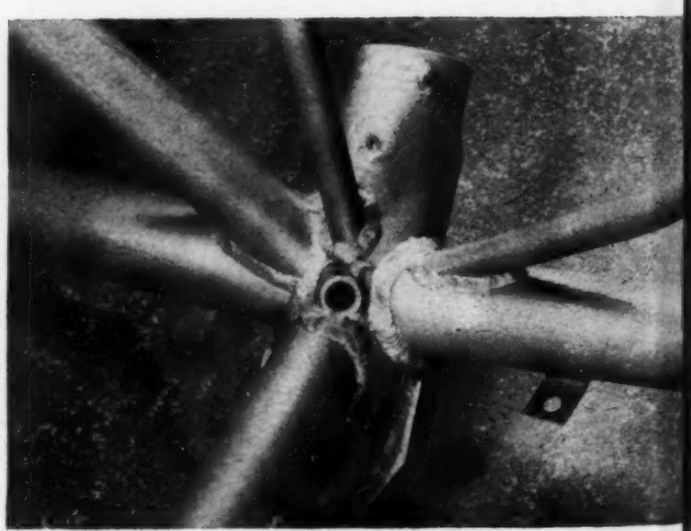


Mating of the bottom, side panel and nose assemblies for the L-13 fuselage is relatively simple, because of the care employed in designing the sub-assembly fixtures, and because the arc welded sub-assemblies are uniform in shrinkage, regardless of which operator produced them. Less shrinkage is experienced than with other welding methods

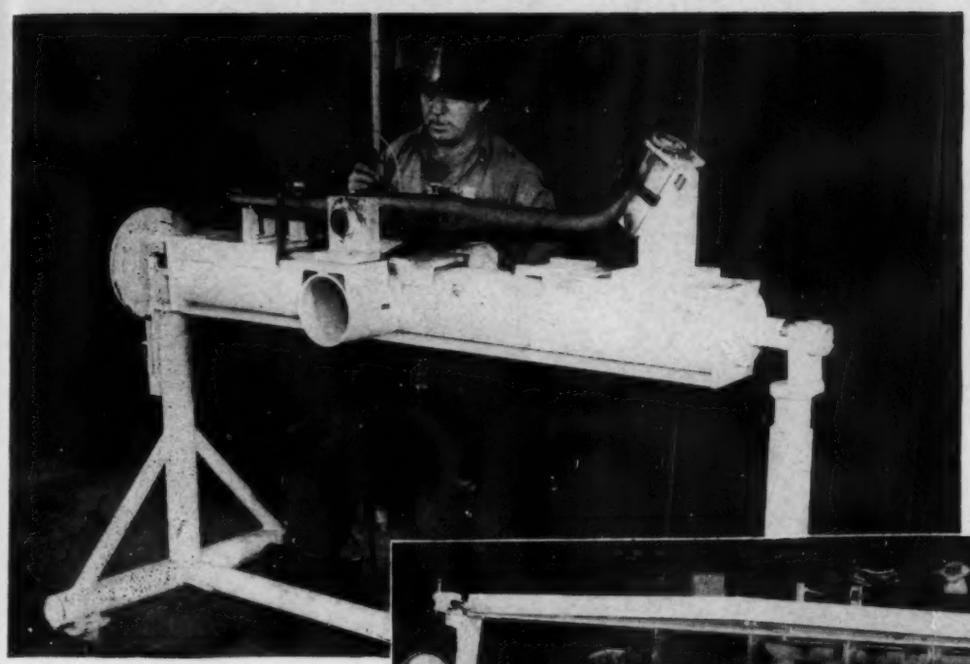
PRODUCTION TIME CUT BY ARC WELDING THIN TUBING

COMPLEX ASSEMBLIES of thin-wall tubing can be arc welded, at great savings in production time, if proper attention is paid to welding-jig design and welding control. Consolidated Vultee Aircraft Corporation has found this true in connection with fabricating the fuselage of the L-13, a small multi-purpose airplane.

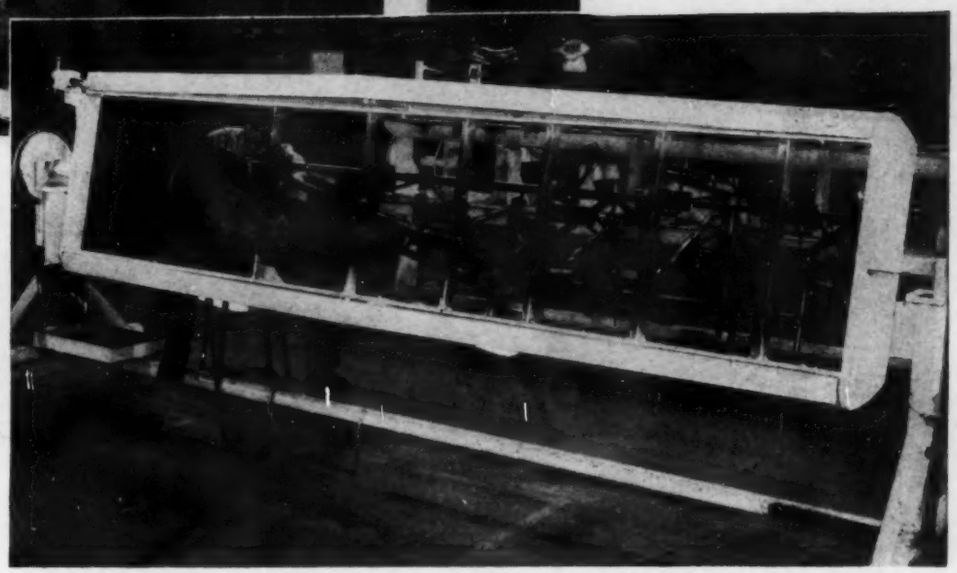
Chrome-molybdenum tubing in sizes from $\frac{3}{8}$ to $1\frac{5}{8}$ in. is used in the L-13 fuselage, and most of this tubing is 0.035 in. thick. No problems have been encountered in arc welding such thin material, even at complex junctions, because two factors have been kept in mind. First welding jigs for sub-assemblies are of the roll-over type so operators can position the joint for flat welding in most instances. Second, operators are provided with foot rheostats so current can be properly controlled at all times. Thus, cratering and undercutting are avoided. Plainweld No. 2 electrodes, made by the Lincoln Electric Company, are standard for all fuselage welds.



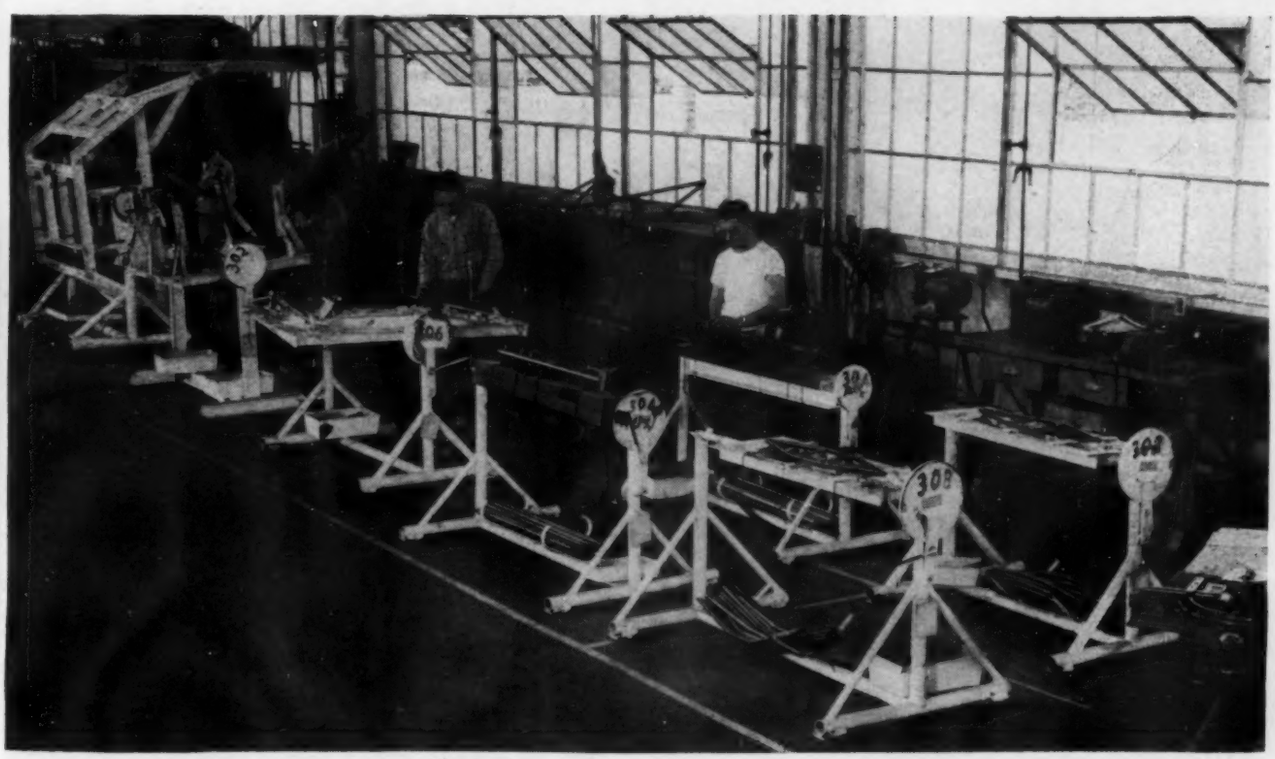
Despite variations in the sizes of tubing employed for this complex junction, clean arc welds are obtained



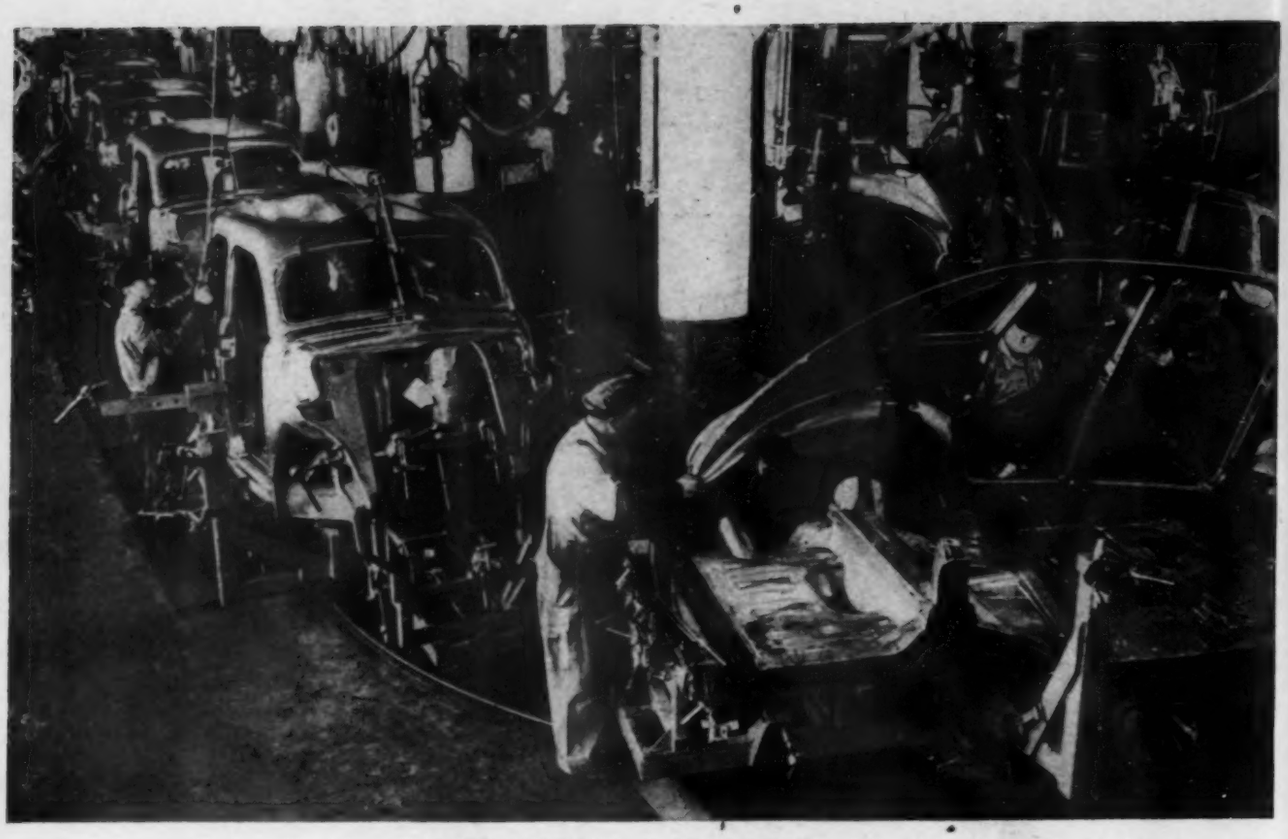
A sturdy roll-over jig is also employed for arc welding the main landing-gear beam of the L-13



Roll-over jigs are used exclusively for building the sub-assemblies. Thus, the operator can position the joint for flat welding. Besides, the jigs are made so he has complete accessibility to the joints. Note the foot-operated rheostat for current control while arc welding a side-panel assembly



Sub-assemblies for the nose are built up in a line of roll-over, or revolving, jigs and are finally mated at the left



MERRY-GO-ROUND CONVEYORS, becoming almost universal for body building lines, solve the problem of returning heavy elaborate fixtures to the starting point and allow electric welding fixtures to be permanently located

NEW IDEAS IN CONVEYORIZED ASSEMBLY

BENCH-HIGH CHAIN CONVEYOR assembles the Nash "600" on fixtures properly located on the chain conveyor to take axles, power plant and muffler

BY CHESTER S. RICKER
DETROIT EDITOR

THE PASSING of Henry Ford brings into sharp focus the contributions that he made to world transportation, good roads, better manufacturing methods and higher wages.

Before Model T Ford production ceased, he was producing two million a year and selling them three for a thousand dollars. Probably no one will ever again see new cars so universally sold at that price. The methods with which he accomplished these results have left their imprint on the whole world approach to multiple production today.

To Henry M. Leland, who went to Cadillac from Pratt & Whitney at the beginning of the century, goes the credit for making interchangeable parts which Ford early appreciated and applied in the manufacture of the first Model R runabout, which sold for $500 when other four-cylin-

From 1913 when Ford installed the first moving assembly line, Detroit has led industry in new and novel handling ideas, some of which are given here to show their possible wide use

der cars were selling for $1,500 to $6,000. But it was not until 1913 that Ford applied the chain-conveyor system of product assembly and materials handling. This idea has had greater effect on manufacturing methods than anything else he did.

Many people think conveyorized car assembly at the Highland Park plant, installed by Charles E. Sorensen, was Ford's first application of the principle. But it was not. Assembly of the Model T fly-wheel magneto was the first conveyorized job.

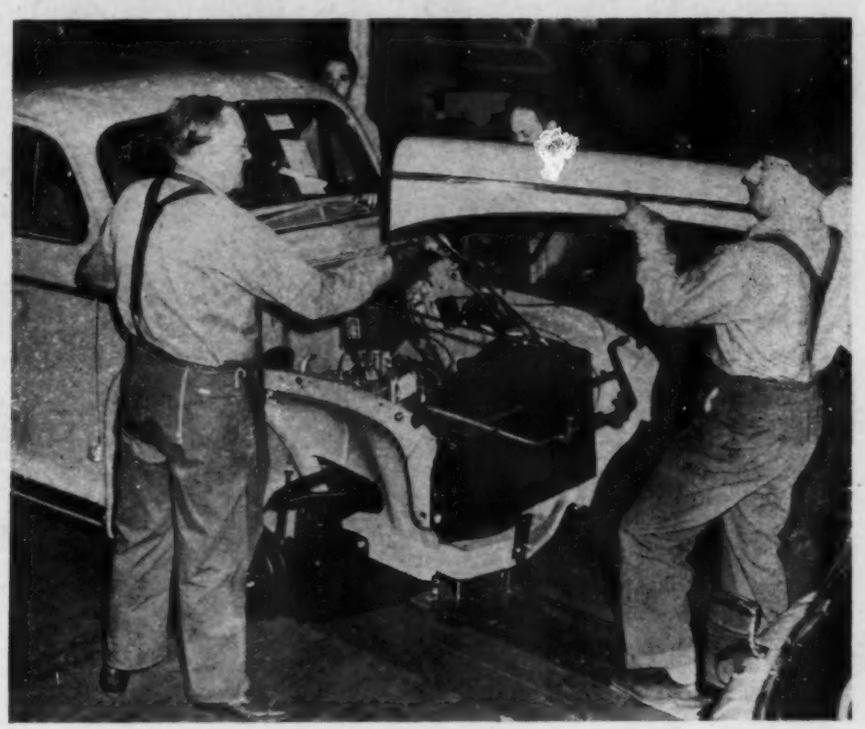
Until then, each man assembled the whole unit with an average time of about 20 min. On the first day the line operated, the time per man was reduced to 13 min. 10 sec. It was found to be running too fast at 5 fpm. and was gradually slowed down to 3.6 fpm. with an increase in production. Then the line was raised 8 in. to cut out stooping; this further increased production.

As the conveyor paced the work, it kept everyone on his toes. Workers began crying for material and better tools, so all material was brought to them and tools conveniently arranged so they could be operated in the proper sequence. Assembly time dropped to 7 min. per unit and finally, after some design changes had been made, the time reached 5 min. per unit. Although these figures may be commonplace today, they were revolutionary 35 years ago.

Two Lines Promote Rivalry

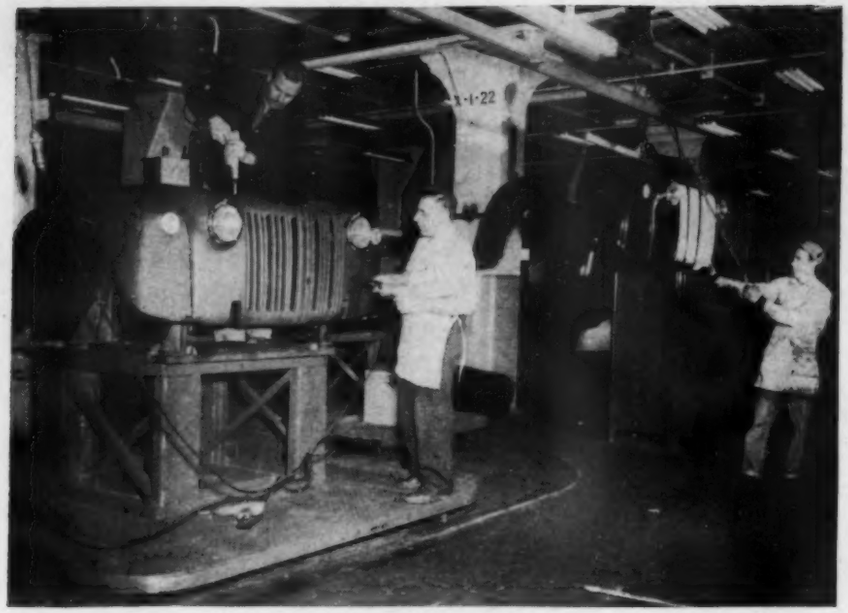
In August, 1913, the chassis assembly line at Highland Park was laid out by Sorensen. Immediately after this started, assembly time dropped from over 14 to less than 6 hr. per chassis. Sorensen had already learned one lesson on the first experiment—that working height affects production. Two parallel assembly lines were provided—one for tall men and the other for short men, with conveyor-line heights designed to reduce fatigue to a minimum.

How many engineers give this consideration today in laying out an assembly line? The use of two parallel assembly lines where this arrangement is possible has a psychological significance. It promotes a certain rivalry between workers on the two lines. This technique was used frequently by smart managers during



NASH HOOD ASSEMBLY makes use of the radiator to locate it properly. Front fenders and grille subassembly are then added as a unit. The conveyor is here at floor level to make the job easier for the workers

THE PLYMOUTH BODY is lowered onto the chassis by synchronizing the speed of the body with that of the chassis. Front and rear supports of the body run on two tracks so the rear end descends on the chassis before the front end is lowered. An auxiliary support holds up the fender-and-grille assembly which is part of the body assembly. The body conveyor is returned to the loading point by an overhead chain conveyor



MERRY-GO-ROUND PLATFORMS (Ford Highland Park) have shoulder-high fixtures designed to facilitate grille and fender assembly

the last war. It is so effective that assembly time on the last of the Model T's was 93 min. per car.

Space economy was another lesson which Ford soon discovered about mechanical handling. Before conveyorizing, the setup for machining the Model T cylinder block required moving the block 4,000 ft., and 594 min. were required to finish-machine it. Conveyorizing reduced the production path to 334 ft. and machine time to 226 min. At the Rouge Plant before World War II one conveyor line, over 2 mi. long, served as parts storage as well as a conveyor.

Mechanical handling, properly planned and installed, can increase production, conserve floor space, clear floor areas wherever overhead conveyors can be used and serve as storage to cushion production between operations. Overhead conveyors always mean clear floors, but many operations are at bench height, so it is often desirable to use a raised conveyor on the floor.

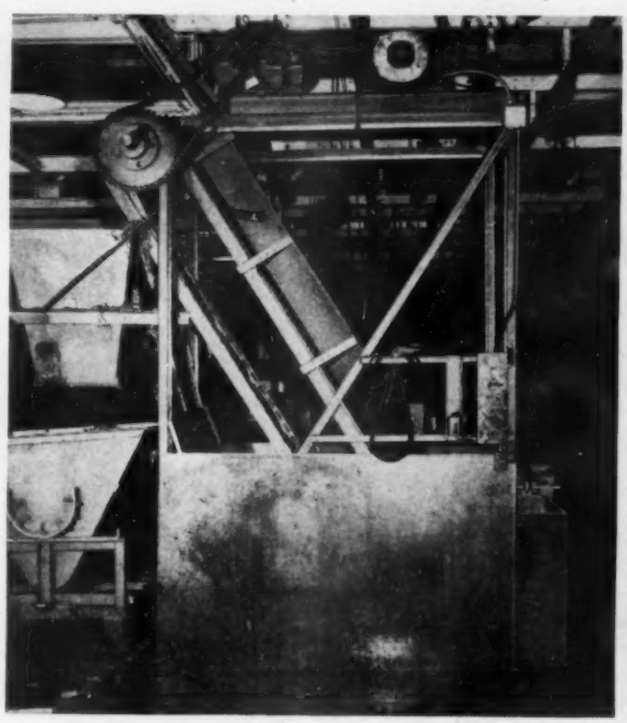
Conveyors are also influenced by the weight or bulkiness of parts to be handled. Where parts have to be put on or taken off a conveyor by hand, 25 to 40 lb. is usually considered the limit, the former for women operators and the latter for men. For subassemblies, the "merry-go-round" conveyor is popular.

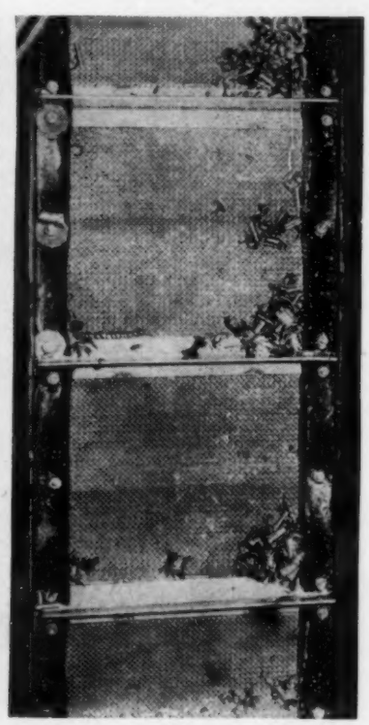
Assembling the frameless Nash "600" at Kenosha introduced a new problem in conveyorizing. It was simply solved by providing assembly fixtures on the chain conveyor at proper intervals so front and rear axles, engine and muffler would be in their correct positions as the body, which serves as the frame, was lowered in position and units fastened.

The Plymouth final-assembly line, entirely rebuilt after the war, had incorporated in it several new features dictated by past experience. Parallel moving steel strips, at floor level and beneath chassis wheels, were provided. Between them was built a pit for workmen having operations beneath the car or service work on the conveyor.

From past experience it was found desirable also to provide working space on the outside of each conveyor chain. A 30-in. trench on each side is covered with maple-faced platforms that are easily removable and much softer than concrete on the workers' feet. In certain sections, the center pit is covered.

Both engines and bodies are conveyed to the final-assembly line at Plymouth. Bodies are automatically lowered on to the chassis which is





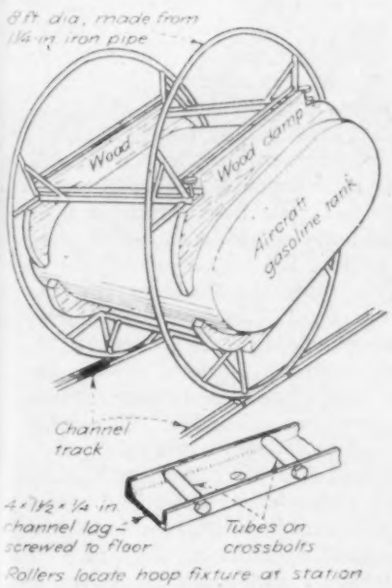
CHIP-REMOVAL CONVEYOR (Plymouth) has a wire fabric belt that picks up steel chips in the crankshaft department and delivers them into a side-dump buggy. Chips fall by gravity into a trench beneath the lathes and are swept down to the conveyor belt by hydraulic nozzles at the ends of each trench. The fabric belt allows the coolant fluid to pass through as it deposits chips on the belt. Angle irons at intervals on the belt keep chips from sliding back

moving, the two lines being synchronized so parts will go together smoothly. The feed-in conveyor line is controlled by a motor man at the mating point of assemblies. He can slow down or speed up the feed-in line and also stop and start both lines in an emergency. This control is important, because clearance between body and chassis parts is only about ¼ in. in many places.

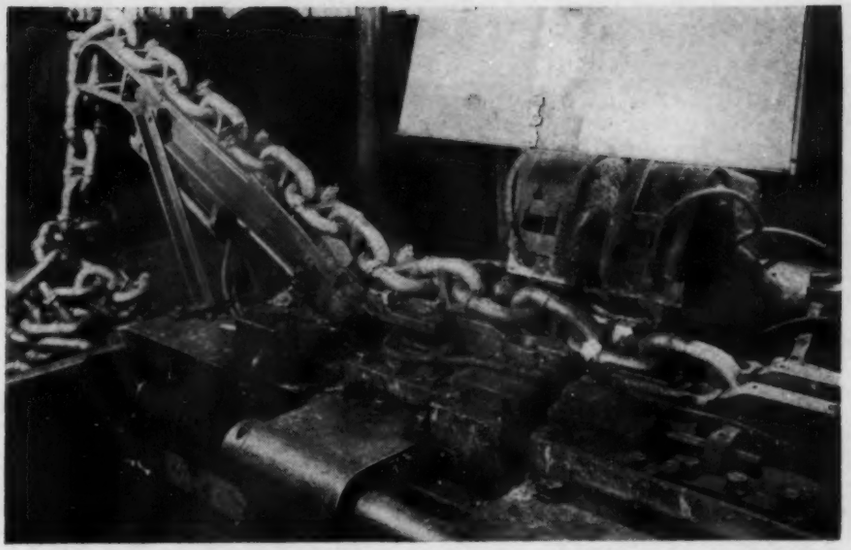
To make sure of this clearance, the rear end of each body is lowered first and the two rearmost body bolts slipped in place. About these as a center, the front end of the body can then be lowered and clear every part of the chassis. This shows how closely production engineers have worked with plant and design engineers.

The latest Ford conveyor system (Highland Park) has two interesting developments: one the unloading and distribution of bodies for trucks, and the other the overhead chassis conveyor which automatically turns the chassis over. The first conveyor provides for sorting the bodies and inspection as they are received.

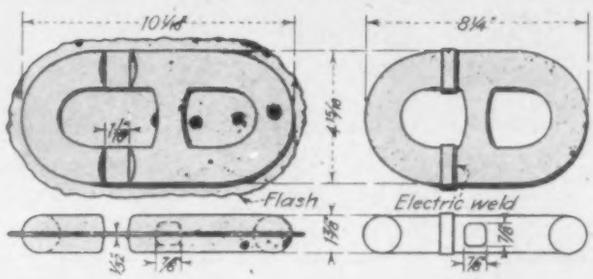
Truck chassis are assembled upside down on a bench-high conveyor and then picked up at the end of the line by the new overhead system. This conveyor turns each chassis edgewise while it passes through the paint-spray booth, then over to 180° and right side up, ready to receive its wheels and roll down the final-assembly line.


8 ft. dia., made from 1¼-in. iron pipe
Wood
Wood clamp
Aircraft gasoline tank
Channel track
4 x 1½ x ¼-in. channel lag-screwed to floor
Tubes on crossbolts
Rollers locate hoop fixture at station

COMBINATION FIXTURE and conveyor (Canadian General Electric) eased handling of gasoline tanks for Lancaster bombers. Made of bent iron pipe, they were useful when tank heads were welded in place, because they could be turned as welding progressed



NATIONAL ELECTRIC WELDER for welding ship's chains is arranged so the chain links are utilized in feeding it from station to station. Chain is fed by an air cylinder beneath the incline, as fast as the welds are made



THE CHAIN-LINK forging becomes two pieces when the flash has been sheared off. This allows links to be assembled and welded into a finished link as at right

Almost since the inception of automobile-assembly lines, chassis have headed in the directon in which the line moves. At Studebaker they move rear end first along the line, because it is easier to get the body threaded down over the steering wheel and other chassis elements than when it is moving in the opposite direction.

Self-conveyors, operated by hand, solved many tricky problems during the last war. Canadian General Electric Co., Ltd. built aluminum gasoline tanks for Lancaster bombers and, because of their bulk, had a problem of handling them both in assembly and in welding. As it was important to keep the weld beneath the torch, the tank had to be turned.

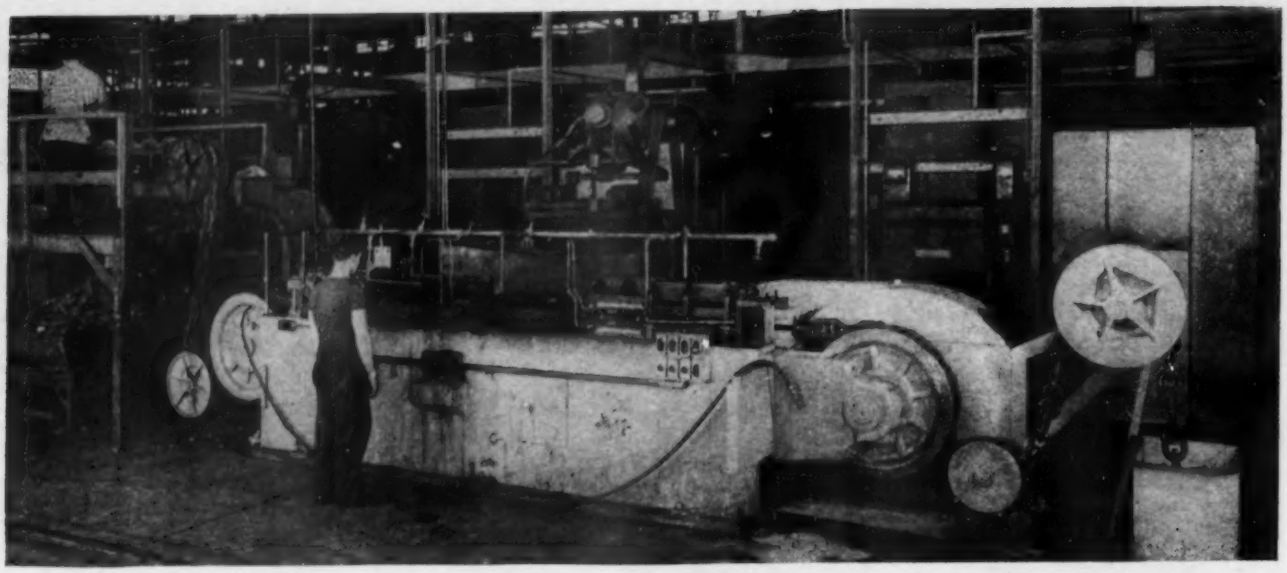
The fixture that provided this flexibility and also acted as a conveyor, was made from 1¼-in. iron pipe bent into circles about 8 ft. in dia. Two such circles were joined by channels, suitably braced, into which the tanks were cradled. These huge hoops ran in 4 x 1½ x ¼-in. channels laid on the floor. At station intervals, two rollers were inserted in each channel to hold the fixture in place and allow it to be turned easily while welding was being done. Because of its large diameter, it required little effort to turn it at the station or to roll it to the next.

Chip removal can be a troublesome problem because of the great quantity turned out by modern machining methods on modern machine tools. At Plymouth Motor Div., each crankshaft lathe has a hole cut through its bed so all chips fall by gravity into a trench below. Bottoms of these trenches slope at about 10° toward a Cambridge steel-fabric belt at the center of the department.

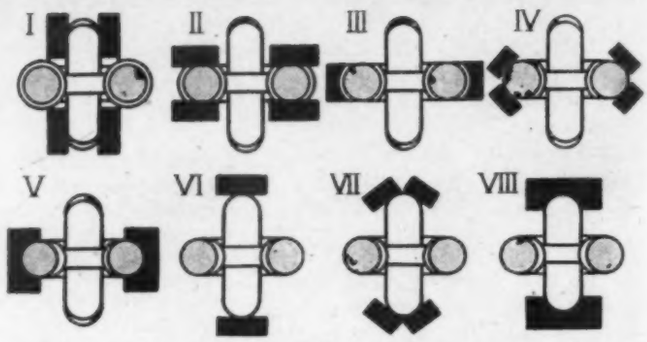
High-pressure nozzles, located at both ends of each trench and fed by Fairbanks-Morse pumps that deliver 1,750 gpm. of coolant solution, sweep the chips as they fall toward the belt. As the chips land on the conveyor, the coolant drains into a sump.

The conveyor belt, having 2x2-in. angles bolted to it, picks up and delivers the chips into a hopper from which they are loaded into side-dump buggies for removal from the plant. To assure chip removal and coolant supply in case of failure of either of the regular pumps, a third or standby pump is provided.

This system not only is effective in chip removal, but also economizes on plant space. Aisles that formerly



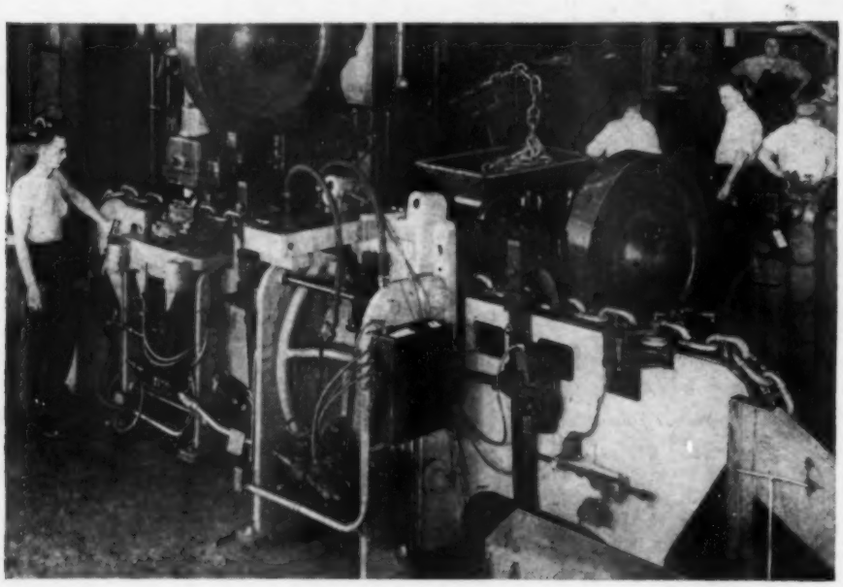
CHAIN IS FED CONTINUOUSLY through this special broaching machine. The chain itself is geared to the feed wheels and is drawn through eight sets of broaches to remove welding flash from outside the links. Diagram shows the order in which the broaching is done at each broaching station



were needed behind the machines for chip boxes and chip pickup trucks are now used for crankshaft storage.

During the war, Mechanical Handling Systems, Inc. developed at its Chicago plant a novel method of making 90-ft. ship stud anchor chain. In the process, the chain acted as a self-conveyor on several machines. Chain links, welded together on 400-kva. National flash-welders, were moved by pneumatic feed that operated in links of the chain and made it self-conveying. When a length was finished, it dropped into a tote box.

Removing the flash from around chain links was done on a broaching machine that had eight sets of broaches in series. The chain again acted as its own conveyor. After broaching, insides of links had a small flash that could not be removed by broaching, so punch presses were used to clean this off. One press was turned over on its side to clean the vertical link of the chain. Careful indexing of the feed was provided to prevent press operation until links were in the proper position.

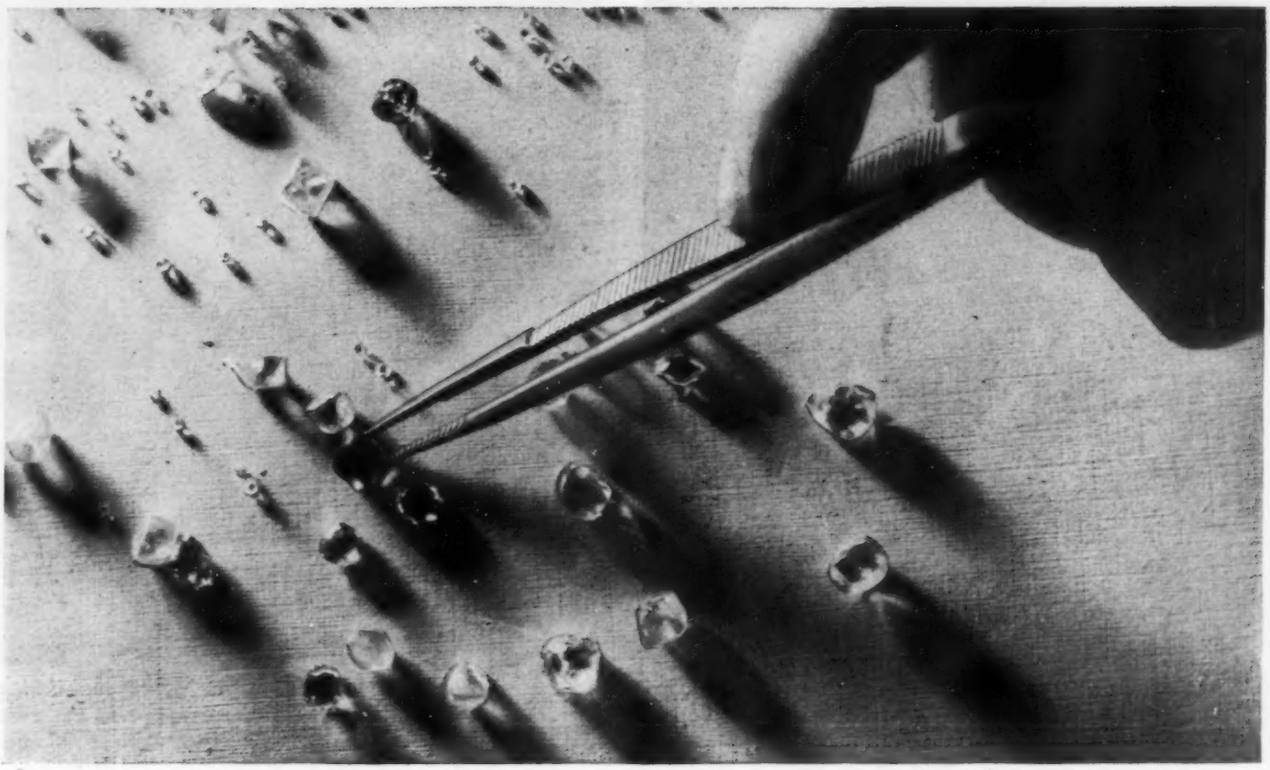


BROACHES can only trim the flash off the outside of the chain links. Inside flash is removed by punch presses. As links are at right angles, it is more convenient to turn one punch press on its side instead of twisting the chain. Here again the chain shape is used to feed it

The broaches removed about 4 cu. in. of steel per min. when the chain ran through the machine at 4 fpm. To get best results, a flood of coolant had to be used to clear chips from the broaches.

Two other applications of conveyors in the automotive industry deserve mention. One is their use for electroplating processes where the time and sequences through various solutions are automatic. The other is the palletized conveyor system that carries a piece through a series of machines—best exemplified by the cylinder-head machining setup at Curtiss-Wright during the war.

Designed and made by Greenlee Bros., these setups required three girl operators and two setup men. They were the answer to production, irrespective of cost, during the war. But only the future will tell whether they can be used where cost per piece comes first.



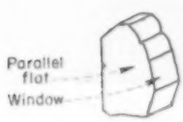
CAREFUL SELECTION *of South African or Brazilian stones is the first step in diamond-die manufacture. On quality, hardness, absence of flaws or cracks depend die life and maximum production*

HOW DIAMONDS DRAW

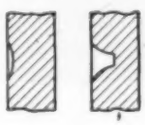
Ultra-Fine Wire

BY ROBERT L. ZAHOUR, Wire Division, North American Philips Co., Inc.

WHERE OVER 0.002 in. is now no longer considered fine, where wire diameter must be measured by weight, where a "pick," neither visible to the eye nor discernible by touch, can mean wire rejection or failure—there the diamond die shines as king. Manufacture of these dies, for wire sizes from 0.0005 to 0.002 in., is nearly an exact science, for only a practically perfectly made die will draw uniform wire. Die condition, draft, lubrication and process care are the four factors on which rests production of the fine wire demanded by present-day electronic devices and their extremely small circuit components.



TWO PARALLEL FLATS *and a window are ground on the diamond to prepare it for drilling of the die opening. The diamond, held in a vertical chuck, is faced on a rough, horizontal stone*



AN INDENTURE, *to guide the drill for drilling the cone, is made at the center of one parallel face with a diamond splinter while the diamond is rotated in a small bench lathe*

DIAMOND-DIE MANUFACTURE

Fine wire before World War II, except in the incandescent lamp industry, was generally considered to range from 0.002 to 0.005 in. in diameter, or was popularly said to be about the size of a human hair.

But the rapid development in wartime communications and allied equipment created a demand for smaller circuit components, many of which required wire finer than a human hair,—in sizes ranging from 0.002 to 0.0005 in. in diameter, and smaller.

Many of these developments have found applications in peacetime electronic devices, creating a greater demand for smaller and smaller components using ultrafine wire of basic metals or alloys.

Applications employing fine wire are components such as coils in hearing aids, exposure meters or precision measuring instruments, where enameled copper wire in sizes ranging from 0.0015 to 0.001 in. in diameter is used; 0.001-in. gold-plated tungsten wire for grid laterals in miniature radio tubes; 0.0012-in. aluminum-magnesium alloy wire for photoflash lamps; and precision radio circuit resistors, some made with 0.0007-in. enameled nickel-chromium alloy wire. So now we think of pre-war fine-wire sizes as a medium-fine range, too large to be classed as fine wire.

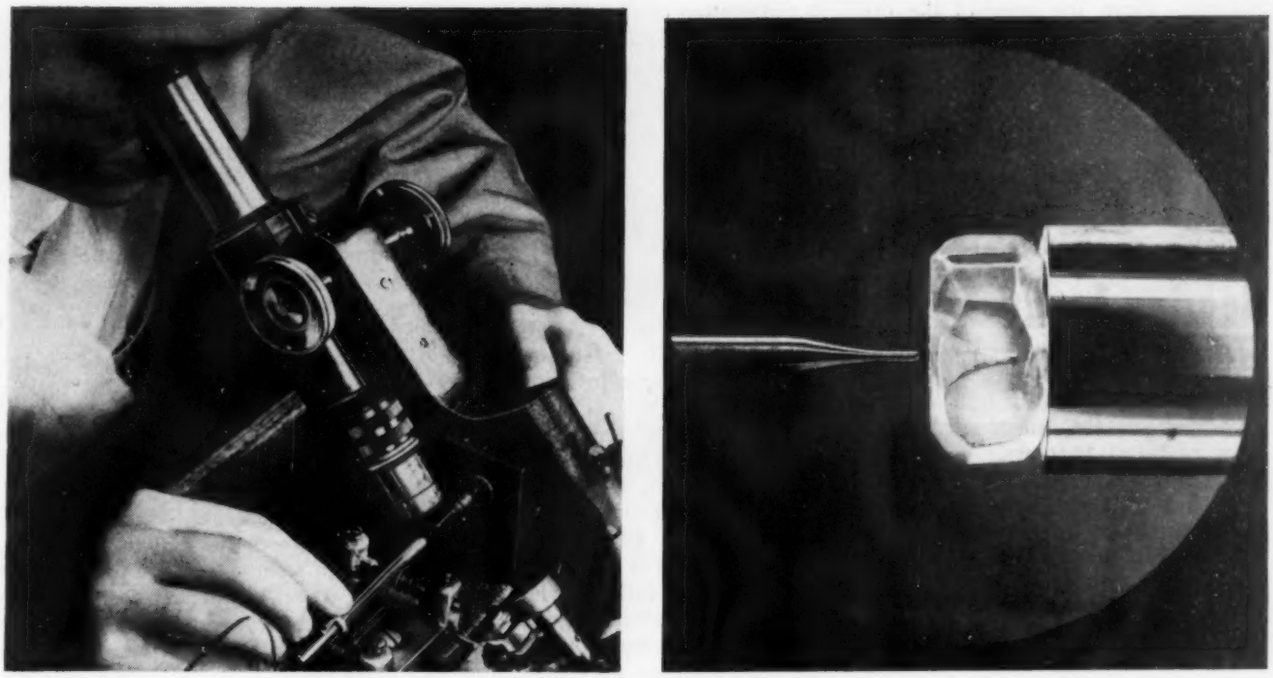
Manufacturing processes for fine wire call for skill, accuracy, precision testing and years of technical experience in the handling of wire made from various metals. The latter requirement cannot be overemphasized, for it takes six months to a year before an operator learns the rudiments of fine-wire drawing. By that time it can be determined whether or not he will develop into a skilled worker.

Unlike the requirements for checking large-wire sizes, measurement of fine-wire requires precision in-

TABLE I—COPPER WIRE STANDARD TOLERANCES

BARE Standard Tolerances						ENAMELED Standard Tolerances		
A.W.G. No.	Nominal Dia. In.	Max. Dia. In.	Min. Dia. In.	Resistance in Ohms* per Ft.	Ft. Per Lb.	Nominal Dia. over Enamel In.	Max. Dia. In.	Min. Dia. In.
46	0.00157	0.00165	0.00149	4.21	134,600	0.00169	0.00183	0.00155
47	0.00140	0.00147	0.00133	5.28	169,360	0.00152	0.00166	0.00138
48	0.00124	0.00130	0.00118	6.72	213,500	0.00136	0.00150	0.00122
49	0.00111	0.00116	0.00106	8.42	269,600	0.00123	0.00137	0.00109
50	0.000986	0.001035	0.000937	10.36	339,000	0.001106	0.00124	0.000966

*Nominal Value — Standard Tolerance ± 10%



DIE CONE *is drilled on a bench lathe with a blunt needle coated with diamond dust and oil paste. Drilling progress is viewed through the window ground in the first operation. Points must be reground frequently to keep them sharp*

struments for dimensional guidance. The ordinary micrometer is of little value in measuring micro-fine diameters, for too often the mechanical error of the instrument is far greater than the tolerances permitted.

Perfect Dies for Perfect Wire

The diamond die is the heart of the fine-wire drawing process. Unless the die is perfectly made in every detail, it will not draw fine wire with a round, smooth surface of uniform diameter.

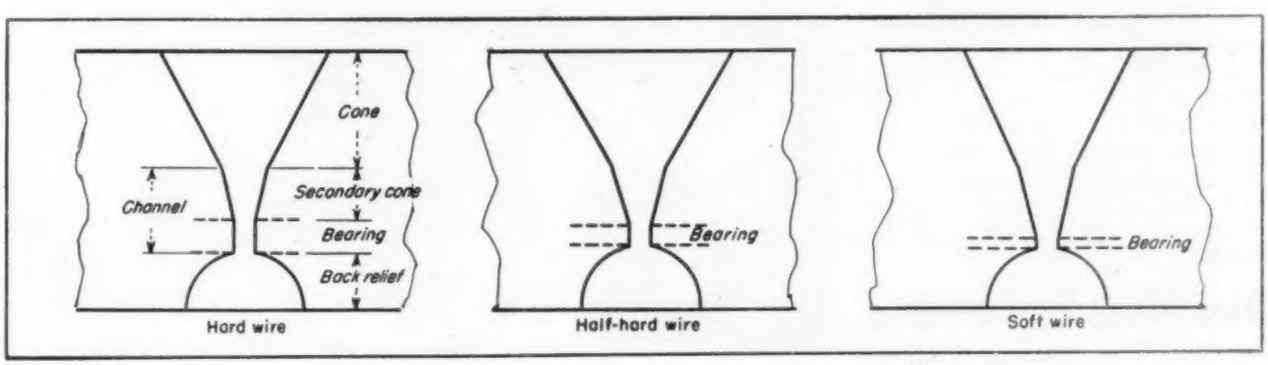
Diamond dies are necessary for drawing fine wire. As the diamond has supreme hardness and maximum freedom from wear, diamond dies can be used for long periods and many pounds of fine wire can be drawn with one die set to the accuracy demanded by the electronic industry.

The first step in manufacture of a good diamond die is careful selection of the stone. Purchase and selection of raw industrial diamonds are a matter of expert knowledge and experience with regard to their source. Because of high quality and hardness, most industrial raw stones are obtained from South Africa and Brazil. Prices closely approach those for the raw ornamental diamonds used in fine jewelry. Stones for making dies to draw wire of 0.0007- to 0.002-in. dia. weigh approximately ¼ carat, or 0.05 grams.

After a diamond has been microscopically inspected for flaws, cracks or other quality imperfections, two sides, parallel to each other, are faced on a rough stone and a center point is located on one face where the drilling operation will begin.

At right angles to these parallel sides is ground another polished surface, designated as the "window." Through this window the operator, with the aid of a microscope, inspects progress of the drilling and polishing operations and checks die shapes. Most of the work to be performed on the stone must be viewed through microscopes.

Using a diamond splinter, the operator makes an indenture at the center point on one parallel face. This indenture serves as a guide for



BEARING LENGTH *depends on wire hardness. Bearing for hard wire is 1 to 2 × dia., for half-hard wire ¾ to 1½ × dia. and for soft wire ½ to ¾ × dia. The length is varied by shaping of the drill needle*

drilling. Next, the cone of the die is drilled in a small horizontal bench lathe.

The stone, cemented on the end of a spindle, is drilled with a blunt needle coated with an abrasive paste of diamond dust and oil. As the point of the needle must be reground frequently, many needles are consumed in this drilling operation.

Bearing Length vs. Hardness

At this stage, the bearing is shaped according to the hardness of the wire material that will be drawn through the die. If the die is to draw hard wire such as tungsten, molybdenum or nickel alloys, then the operator shapes the needle and guides the drilling process to produce a long bearing, 1 to 2 times hole diameter.

For drawing half-hard wires, such as phosphor bronze, steel or hard brass, the bearing is not quite as long as that for hard wires, being ¾ to 1½ times hole diameter. And for soft wires like copper, soft bronze, gold, silver, nickel, aluminum or soft brass, the bearing is made short, or ½ to ¾ the diameter of the hole.

Skilled operators spend many hours of careful workmanship and tedious microscopic observations in drilling this channel accurately and correctly for the character of the wire to be drawn. Precise centering is required during the operation to insure accurate roundness of the finished die.

At this stage, the drawing surface, or channel, is complete. To finish the die, it is necessary to form a junction between the rear face and the bearing. To make this opening, the diamond is mounted on a gently oscillating horizontal spindle, with a microscope positioned above for viewing purposes.

A needle ground to a blunt rounded point and coated with abrasive paste is accurately aimed at the center of the rear face or back relief. Drilling continues while the operator watches its progress constantly through the microscope, until there is a clean countersunk exit or opening between back relief and bearing.

Dies Must Be Polished

Drilling of this opening is not the final step. Polishing, which follows, is one of the most important steps in completion of a good diamond die. The surfaces that must be polished are those of the secondary cone and bearing. Unless these surfaces are smooth and highly polished, wire drawn through the die will not have a smooth, round, lustrous surface, so essential in ultrafine sizes.

The cone and back relief are also polished, but the degree is of minor importance. A well-polished die will give long and continuous production, whereas a rough, poorly polished die will result in low output and frequent interruptions in service.

Two methods are employed in polishing diamond dies. In one method, the dies in a vertical polishing machine revolve at a high speed, while a finely ground nonrotating needle is mechanically oscillated from left to right. This swaying or rhythmic action of the needle blends the angle between the cone and the secondary cone of the die to produce a smooth entrance, and at the same time the bearing is elongated and polished to a high finish.

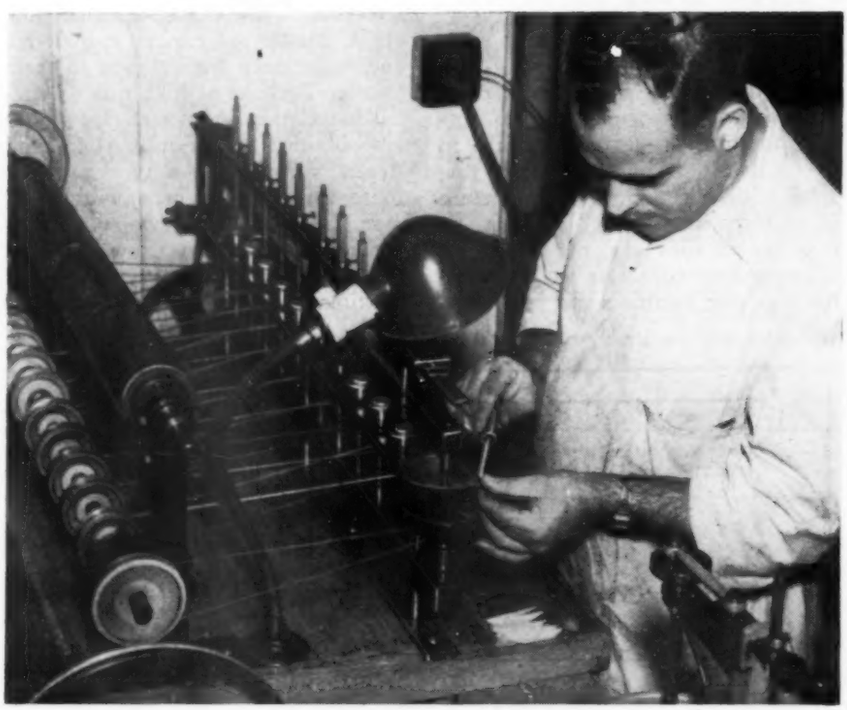
In the other method, the dies are polished in a horizontal polishing machine where both die and needle revolve. A high polish is imparted to the bearing without altering the length of the channel. The secondary cone angle is polished at the same time.

A well-made die will have, in the secondary cone and bearing, a mirror finish which is essential for minimizing die wear and giving maximum production. But a badly drilled, poorly polished die will have a comparatively rough secondary cone and bearing. Such a die will produce unevenly drawn, out-of-round wire, will wear rapidly and have a short life, and can seldom be recut satisfactorily for further service.

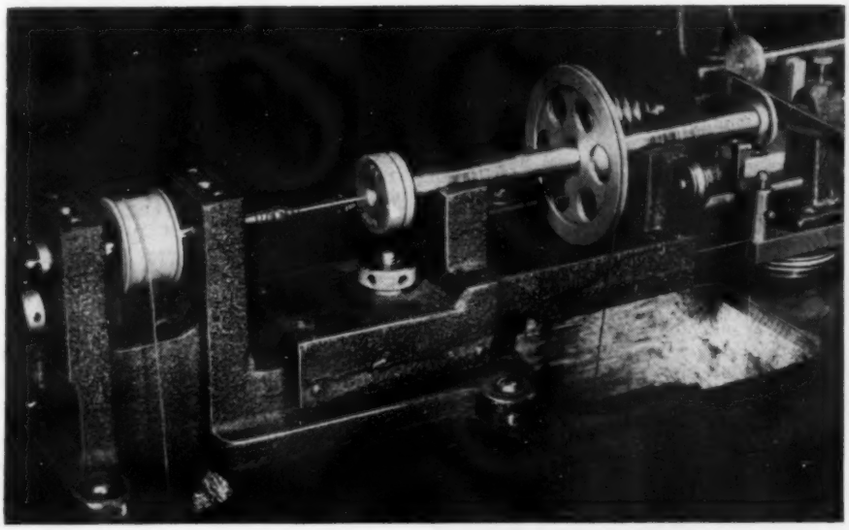
When the polishing operation is completed, the die is carefully and accurately mounted in either a brass or steel casing on which is stencilled the die size and style reference number.

After sizable wire production, even a good die will have suffered enough wear to require replacement. Die wear is checked carefully by periodic measurement of the wire diameter at each draw. When the wire draws to its maximum diameter tolerance at any point, the corresponding die is replaced by a new die of the original size.

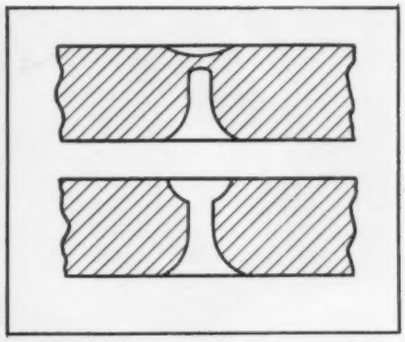
If a die has not been overrun and if it has been used with care and checked regularly, it can be recut and polished for further service in drawing wire of a larger size. The number of recuts a die will take depends largely on the size of stone and the care it has received during use.



DIAMOND DIES *can be polished in a vertical-spindle machine with the dies revolving at a high speed and the polishing needles oscillating back and forth*



DIE AND NEEDLE *revolve in horizontal polishing machines as the bearing is polished and angles are blended in smoothly*



JUNCTION *between bearing and rear face is formed with an abrasive-coated needle, the diamond being mounted on an oscillating horizontal spindle*

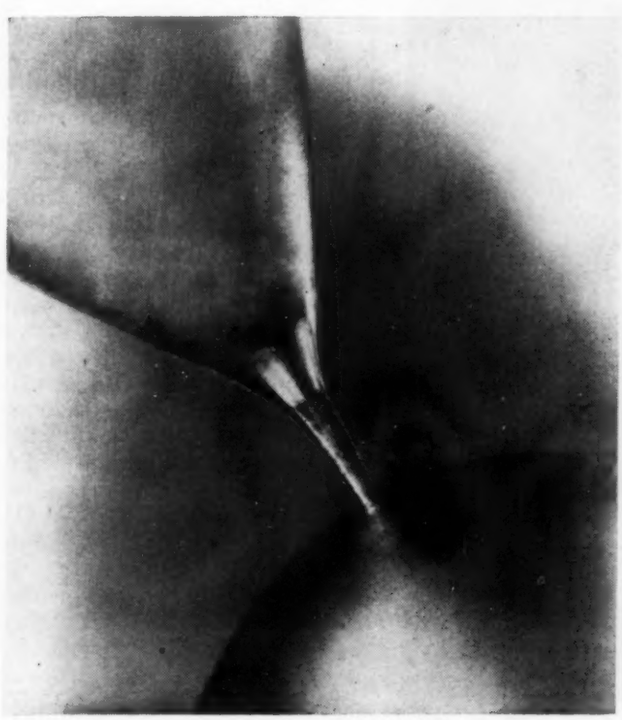
WIRE-DRAWING PROCESS

The fundamental principle of drawing wire is essentially the same as the historical method used by the monk Theophilus in 700 A.D. But since then, many refinements have been made in equipment to obtain greater precision in physical and electrical characteristics of wire.

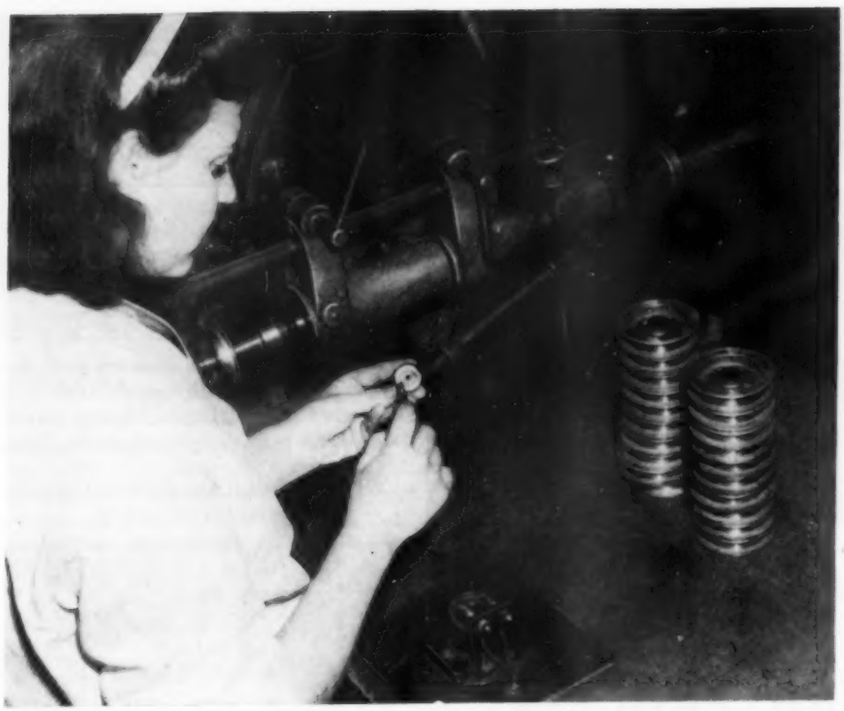
Precision drawing of fine wire is highly essential because narrow tolerances must be met in small components for modern electronic applications. With the exception of molybdenum and tungsten, most fine-wire metals and alloys are drawn cold. In other words, they

TABLE II—NICKEL-CHROME-IRON WIRE RESISTANCE

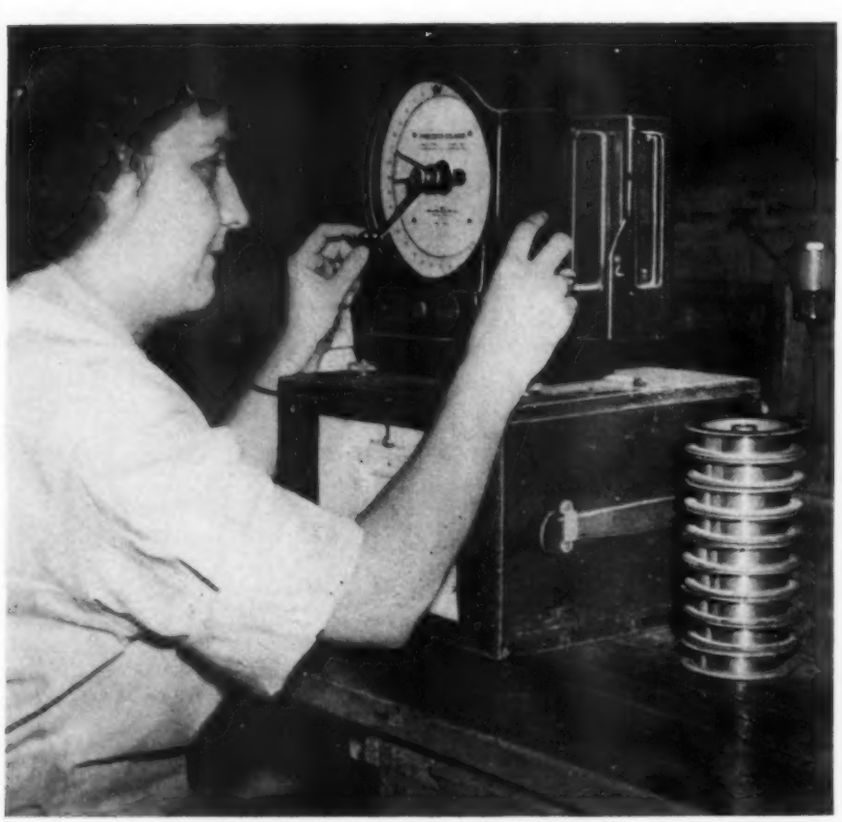
Wire Dia. in In.	Resistance in Ohms per Ft. @ 20 C.
0.00070	1377.55
0.00075	1200.00
0.00080	1054.67
0.00085	934.26
0.00090	833.33
0.00095	747.92
0.00100	675.00
0.00110	557.85
0.00120	468.75
0.00130	399.41
0.00140	344.39
0.00150	300.00
0.00160	263.67
0.00175	220.41
0.00200	168.75



WELL-SHAPED, *highly polished diamond die at left has a smooth contour, while the die at the right is rough, showing poor drilling and polishing practice. The latter will produce uneven wire and wear rapidly while in service*



FINE WIRE *can be threaded through a die hole by first etching its end to a point in acid. During drawing it is guided by coned pulleys as it passes between dies and is reduced in diameter*



SIZE OF FINE WIRE *is not measured by micrometer. Instead a specified unit length is weighed on a precision torsion balance, and its average diameter is calculated from the weight and known density of the metal*

are given no auxiliary pre-heating treatment before the wire enters the die. The following description of fine-wire drawing covers only the cold-drawing process.

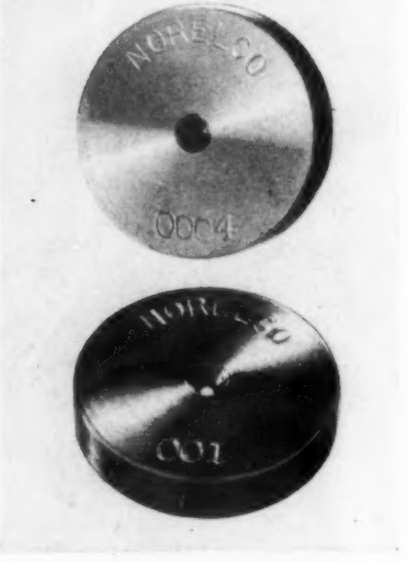
A modern motor-driven machine for cold drawing of fine wires is equipped with a number of diamond dies arranged in a sequence of decreasing size. Wire to be drawn is pulled in series through all dies by means of coned pulleys, and is spooled at its smallest diameter. This operation is performed within only a few feet of space.

Three critical factors must be considered if fine wire is to be drawn smoothly and uniformly round to close physical and electrical limits:

1. Selection of diamond dies and lubricants.
2. Careful regulation of drawing speeds and annealing processes.
3. Accurate determinations of draft (reduction in diameter).

Properly shaped, highly polished diamond dies are carefully selected for the type of metal or alloy wire to be drawn. If hard-alloy wire is to be drawn, the die selected must have a long channel; for half-hard metals, a die with a medium-long channel will be used; and when softer metals are to be drawn, a die with a short channel will be chosen.

Wire, threaded through each die for drawing, is guided alternately from one die set to the other by coned pulleys positioned on each side of the die boxes. Dies are lubricated constantly during drawing



DIAMOND DIES, *after polishing, are mounted in brass or steel casings stenciled with the die size*

to minimize wear. Continuous and thorough lubrication of dies at all times carries off much of the heat generated during drawing, and is effective in increasing die life and reducing die cost.

Lubrication Prevents Die Wear

To prevent rapid die wear during drawing, a proper lubricant suitable for the kind of wire to be drawn must be selected. Good judgment gained through experience and a knowledge of the properties of metals are chief factors in this selection.

Sometimes fatty or heavy oil emulsions are satisfactory, while in other instances light lubricants of soap and water are applied. All lubricants, however, must be chemically inert so the high surface luster produced on the wire is not impaired.

For some types of fine wire, the draft per die is as small as 0.00015 in. Yet on a modern multiple-die machine it is possible to draw in one operation from 0.005- to 0.001-in. dia. at a speed of 3,000 fpm.

Maximum tolerable reductions will vary somewhat, depending on hardening characteristics of the wire alloy. Some alloys harden faster and create more heat and wear than others as they pass through dies. Quick-hardening alloys must be drawn at speeds slower than those for soft, ductile metals. Therefore, drawing speeds will vary from 100 to 5,000 fpm. at the take-up spool. The correct speed for a given wire is determined largely on the basis of experience and knowledge of metal behavior.

Some wire alloys harden quite rapidly when passing through only a few dies. Unless the wire is annealed before continuing through subsequent dies, it will break. Where such rapid hardening develops, as with resistance wires, the wire alloy must be annealed at appropriate steps during drawing.

TOLERANCE and QUALITY INSPECTION

Electrical as well as mechanical tolerances required for fine wire employed in the manufacture of small components are of extreme importance. These tolerances must be maintained so the wire will stay within the physical dimensions and electrical resistance for which a given component is designed.

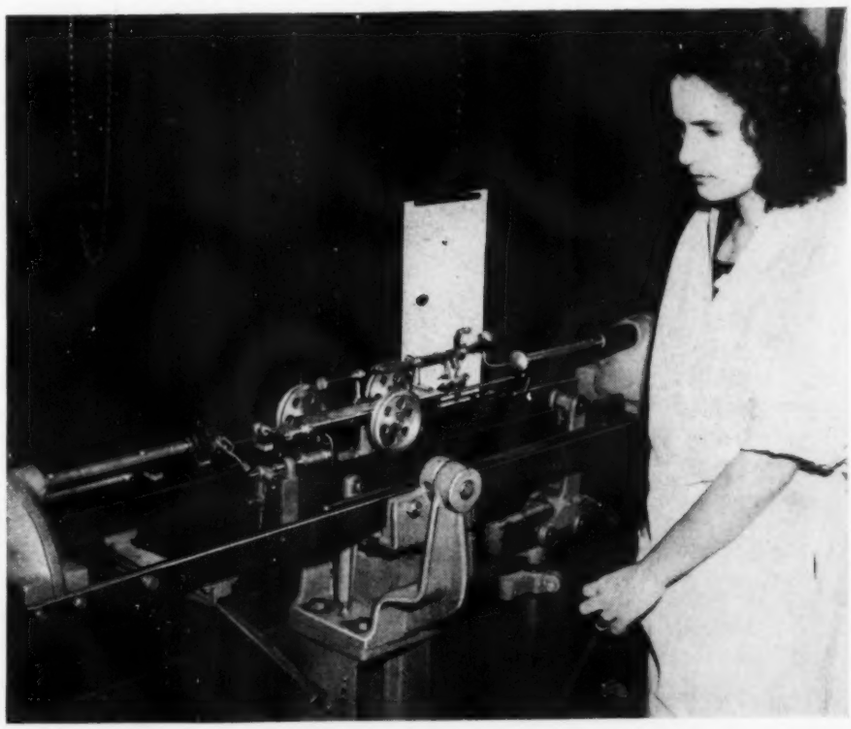
For finished wire these tolerances cover a permissible variation from the exact, or nominal, diameter and a tolerable variation from the exact ohms per foot specified by the customer. In fine copper wire, limits on diameter are of utmost importance, because this wire, after being enameled, is often used by a component manufacturer in winding small coils where a definite space factor is involved.

Table I gives standard factory tolerances that must be met in drawing fine copper wire and also over-all diameter tolerances on enamel insulation applied to bare wire. Likewise, fine-wire alloys used in the manufacture of precision resistors for radio, radar and other electronic communication equipment must be made within narrow limits of specified ohms per foot and permissible variations in diameter.

Component manufacturers usually specify these resistance and over-all diameter limits. Maximum and minimum tolerances specified on resistance may vary from 2 to 10%, while on the diameter over the enamel a maximum size is specified with the additional requirement that adequate insulation at a given test voltage must also be insured.

Table II illustrates resistance values for given bare diameters of fine nickel-chrome-iron wire employed in the manufacture of precision resistors. It is interesting to note that an increase or decrease of 0.00005 in. in the finer wire diameters causes a change in resistance of about 10%. Hence, if a component manufacturer specifies a resistance tolerance of plus or minus 5 or 7%, it means that a diameter variation of plus or minus 0.00005 in. from nominal is too great and cannot be permitted.

These facts regarding the critical importance of specified tolerances



TENSILE STRENGTH AND ELONGATION *of fine wire are measured on a precision testing machine, which records test results graphically on the paper chart, so customers' specifications on elongation can be met*

indicate that only precision methods for measuring and testing of fine wire can insure adequate accuracy. The ordinary micrometer cannot be used for checking diameters, because a small error in applied pressure or in calibration of the instrument may exceed the tolerance specified on the wire size.

Measurements By Weight

Accurate measurements of fine-wire sizes are made by weighing a specified length of wire, rather than by directly measuring the diameter in inches. For this purpose, a precision torsion balance is used which may be calibrated, for example, to as close as 0.01 mg. A sample specified length of a given fine wire is accurately cut, twisted a few turns and suspended on the weighing hook of the torsion balance.

From the weight of this sample and the known density of the wire alloy or metal, the average diameter can be accurately computed. This measuring operation is carried on periodically during drawing, not only to see that the wire diameter is within permissible tolerances, but to check on die wear as well.

After a sample is weighed, sections are carefully cut and placed under a high-powered micrometer microscope to check on the roundness of the cross-section. If the section appears out-of-round, the operator knows that a die has become worn and immediately checks the die set. Any defective die is replaced with one of proper size, and the faulty die is turned in to be recut and polished for future additional service.

Next, the surface of the wire sample is examined carefully under a microscope for "picks." These are minute metal splinters that project from the wire surface and are usually caused by a die, the bearing surface of which has become roughened. Picks are neither visible to the naked eye nor can they be felt by touching or rubbing the wire.

But surface picks on a fine wire will cause voltage breakdown of the insulation after the enamel is applied to the maximum tolerance limit of thickness. Even if picks are short, so the maximum permissible thickness of enamel covers their points, the insulation coating will only withstand low voltages and will break down when the higher voltages specified for electric test are applied.

Elongation Specified To Ease Handling

Another important test is that of tensile strength and elongation. From the standpoint of excessive die wear and wire breakage during drawing, much has been said about the hardening property of metals, especially for resistance wire alloys. Moreover, wire that is too hard presents difficult problems for subsequent handling by the component manufacturer, because hard wire tends to curl readily and breaks easily under the slightest pull. So most consumers specify a certain percentage of stretch, or elongation, to avoid these disadvantages.

Hard wire, therefore, must be annealed during manufacture, as previously described. Tensile strength and elongation properties of a given fine wire are measured on a precision tester which graphically records the results on a prepared chart. With the aid of this testing device, customers' elongation specifications for finished wire are met with carefully planned coordination of annealing stages and drawing passes.

In addition to physical and mechanical inspections of fine wire, tests must be performed to check the electrical resistance requirement, usually specified in ohms per ft. For this test, samples of a given wire, cut exactly to 1-ft. lengths, are accurately measured for resistance on a Wheatstone bridge.

Occasionally, a small fraction of a percent of foreign impurity may be present in an alloy, causing an excessive variation in the electrical characteristics of a wire of a specified diameter, or the base metal may be too pure and its mechanical properties gradually begin to change shortly after drawing. A chemical analysis frequently fails to reveal these minute metallurgical differences in the melt, and other methods of checking must be employed to detect them.

Modern metallurgical studies have revealed that the atomic arrangement of pure metals and alloys has a definite effect on electrical as well as mechanical properties of these materials. It has been found that nature assigns to every metal an atomic structure and atomic spacings which together are unique and distinctive, so each material has its own characteristic X-ray diffraction pattern. The pattern provides an accurate means of identifying metals and alloys in much the same way that fingerprints unmistakably identify persons.

This discovery has led to use in the fine-wire industry of another precision instrument, the X-ray diffraction unit, which has been developed for this and many other applications. With this instrument it is possible not only to check the texture of metals in question, but also to analyze the raw material for the presence of other metals before processing begins.

X-RAY DIFFRACTION *permits checking wire metals for the presence of impurities. The diffraction film here shows the pattern characteristic of pure silver wire. Impurities can cause variation in electrical characteristcs*

ELECTRICAL-COMPONENT *manufacturers usually specify resistance limits on purchased wire. The resistance in ohms per ft. is measured on a Wheatstone bridge by checking samples of 1-ft. lengths*

WHILE WE DELAY—

Russia Drives for the Atlantic

IN THE STRUGGLE to keep western Europe west of the Iron Curtain it is later than you think. Unless the United States quickly mobilizes its own and other nations' resources, World War II will be lost as World War I was lost—by no economic follow-through.

Millions of people in western Europe, living in cold homes or no homes at all, face another winter of near starvation. Some countries are absolutely without dollars to buy abroad the food and fuel they need for survival. Others slide toward that desperate state.

In this welter of misery Russia grasps for dominion over all Europe. Everywhere, as cold and hunger deepen and as men begin to doubt America's determination to help, Russia turns on the pressure. In France the Communists drive to overthrow the Government. In Italy they do likewise. In Greece Russia kills the United Nations investigating commission. In Trieste Tito elbows us out of the way. In Germany and Austria the Soviet commanders alternately stymie and flout the Allied governments.

FACED WITH this bloodless attack, the leaders of western Europe and of the United States have not covered themselves with glory.

Look, for example, at what the sixteen European countries participating in the Paris meetings on the Marshall "plan" first proposed to the United States as a catalog of their needs. In the main it was simply an adding up—to $30 billion—of what the various countries thought they needed to keep going in the same old way at the same old stands. There was no real start on plans for the mutual aid by European states which is the essence of a successful recovery program . . . no real start on plans to knock down the barriers which divide European trade into hopelessly inadequate little pockets . . . no real plans to clean up currencies which deteriorate so fast nobody wants to work for them. *In fact no plans to make people want to work.*

Meanwhile, what have our leaders offered? Not much more than one fine commencement speech by General Marshall, outlining a good idea, and a couple of carloads of statistics, with more to come.

Not even a beginning has been made on the most crucial part of any European aid program—*that of explaining to the American people what their part must be and why.* It is true that not all the reports of all the statistical committees have been completed. They never will be. But it is also true that the broad outlines of what the United States must do to save Europe are already clear. And it is not simply to provide more dollars, although $12 to $16 billion more—the cost of 6 or 8 weeks fighting in World War II—may be required.

A far more basic requirement is leadership which will lift Europe out of the slough of despair and get recovery rolling. Without that leadership more billions for Europe will buy us nothing but more bitterness and remorse on both sides of the Atlantic.

WHAT ARE the ingredients of that leadership? Here are a few:

1. A bi-partisan program for European recovery.

It should be so thoroughly understood and so overwhelmingly supported by both parties that playing politics with it will be like selling military secrets to the enemy.

Truman and Vandenberg have failed miserably to develop and explain a complete program—one in which Europe and America can have full confidence. Nor have Taft and Dewey and other candidates for high office pledged that politics will stop at our shoreline. These men must speak out. To date Herbert Hoover alone has had the courage and vision to state a program.

2. A mobilization of American food supplies.

We must assure people at home and abroad that our crops, cut down by drought and heat, will be stretched to cover minimum European needs (with whatever help we can muster from other nations) without forcing still higher food prices here.

Some food experts are comfortably confident that the stretching can be done. But

meatless and wheatless days, higher extraction of flour from wheat and similar voluntary conservation moves would make it surer. And they would demonstrate that a free country can mobilize itself to meet a very serious crisis.

3. An understanding that relief is one problem and recovery another.

Both problems must be solved. Relief emergencies must be met, some of them at once. But they must not black out the longer task of recovery. Italy illustrates the point. Italy, particularly the south, is flat broke. Help is needed right now to keep people from dying in the streets. But we must eventually do more than keep the Italian people alive. We must help them get back to useful work so that they can stand on their own feet.

4. A steady insistence on results—which means that Europe must find a way to make its people want to work.

In the U.S.S.R. they have a way to get things done. It is to liquidate those who do not work. In the U.S.A. we have a way to get things done. It is to create incentives to make people want to work. Western Europe, notably France and Britain, has fallen between two stools. It has socialized away the incentives, and it does not yet, thank heaven, enslave the laggards. We should make it crystal clear that we have no designs on the national "sovereignty" of others. But we should make it equally clear that we insist that those countries which receive our aid work hard enough to get results. To this end continued aid should be on an installment plan, each installment conditional on getting results. Otherwise more billions can easily disappear down the drain.

5. Insistence on all-out self-aid by European countries.

That is the constructive core of the Marshall idea—to help Europe to help itself. In his brilliant "Report on Germany" and how to get it "off the backs of the American taxpayer," Lewis H. Brown, Johns-Manville Chairman, shows how the export of only 10 million tons of coal a year from Britain to western Europe would speed industrial recovery of the Ruhr immeasurably. There are countless other cases where effort in one European country—or a group of countries—will break a big industrial bottleneck in another. We should insist that everything possible be done to see they are broken.

6. An agreement with Britain and France giving us authority in western Germany equal to our responsibility.

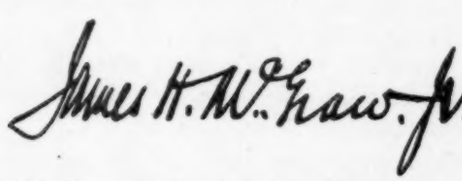
Britain is shifting to us most of the financial burden she has been carrying in the German occupation. Less directly we shall also be carrying much of the French occupation load too. We must have authority in the economic field commensurate with our responsibilities. Otherwise the management of western Germany can poison Anglo-American and Anglo-French relations in addition to wasting resources we could use to promote general European recovery.

It is truly said in the scriptures that the Lord loveth a cheerful giver. But it is not recorded anywhere that anyone, including the recipient, loves a soft-headed giver. Hence as a capstone any program of aid for Europe should have machinery assuring that only what is needed is sent; that what is sent does the job for which it is sent; and that arrangements are made for the recipients to pay back whatever they can.

THE AMERICAN PEOPLE should be told clearly by their leaders that there is no assurance that the best possible program of economic aid for Europe will do the job. The time is very late.

In France and Italy, as our help falters, the Communists right now are provoking strikes which will make the people's suffering more acute. They hope, of course, to overthrow the governments in both those countries and to seize control. If Communist dictatorships are clamped on France and Italy this fall, Russia and her satellites will have advanced to the Atlantic. The Iron Curtain will have moved 500 miles west—toward us.

Americans should be clearly told, therefore, that not to undertake an immediate program for the recovery of Europe is to bring closer the greatest possible national disaster—World War III.



President, McGraw-Hill Publishing Company, Inc.

THIS IS THE 61st OF A SERIES

TALKING SHOP

Portable Cafeteria

BABCOCK & WILCOX built a personnel and visiting vendors' building just outside its main gates at Barberton. Added as a second story was an air-conditioned cafeteria. But workers complained that there was too much portal-to-portal lunch time.

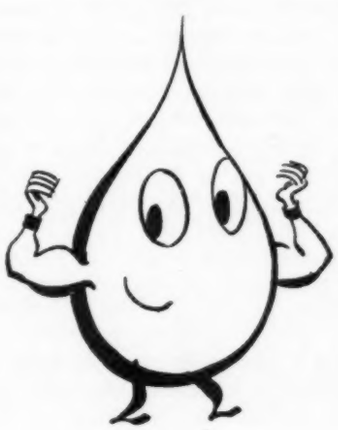
Now the cafeteria manager makes a daily mimeographed menu, sent to each foreman and asst. foreman. It has spaces for 16 separate lunch orders by clock number, gives prices, etc. Orders are delivered 10 to 15 min. before lunch. Coffee orders are delivered in the man's own vacuum bottle, kept clean by the cafeteria. Up to 70% of the employees on all three shifts use the service, some for lunch, some only for beverage and/or dessert.

Carbides Again

SILICON-CARBIDE hollow rollers, cored for water cooling, and other parts for furnaces are now being produced. They are claimed able to withstand 2475 F. indefinitely—important in some heat-treating operations and for processing and fabricating stainless steel.

The Old Oil

PULLERS and hydraulic jacks will remove large anti-friction bearings from machines, but they are hard on tempers and time. Dr. Haakon Styri, director of research for SKF Industries, Inc., reports a new and easier method. You press oil from a hand-operated hydraulic pump between the bearing bore and the shaft on which it is mounted. That makes the inner ring expand and "float" on the oil film, easing removal. Oil pressures of 7,000 to 8,000 psi. reduce dismounting time to 10 or 15 min. The method, introduced by SKF, can also be used on shaft couplings.



Welding Trick

A 200-FT. STRIP of 0.30x36-in. type 302 stainless was recently inert-arc welded into a belt by a new G.E. technic. It was essential that one side be polished to high gloss, the weld ground flush, the weld square and without warp, and the joint strong enough to stand continual flexing and tension. The trick was done with an air-cooled manual inert-arc holder clamped in a crawler carriage which traversed the joint at 6 ipm. A 1/16-in. tungsten electrode with 47-amp. dc. and straight polarity was shielded by 5 liters per min. of argon gas. One belt end was cut square, the other concaved uniformly from 4 in. from each edge to about 1/32 in. at the center. The arcuate end overlapped the square one about 1/16 in. at the start, just barely at the finish, with copper chill clamps ¼ in. apart aligned with the groove in the copper backing bar. The weld bead was ⅛ in. wide and 1½ times stock thickness, free of cracks or pinholes, and mostly on the root side. This was ground off.

Theory is to adjust heat input for rapid fusion and copper chill bars for rapid freezing—thus causing weld metal to pass rapidly through its critical range both ways. Moderate clamping allows parent metal to slip instead of cracking while weld metal is in the critical stage.

Temperature Next

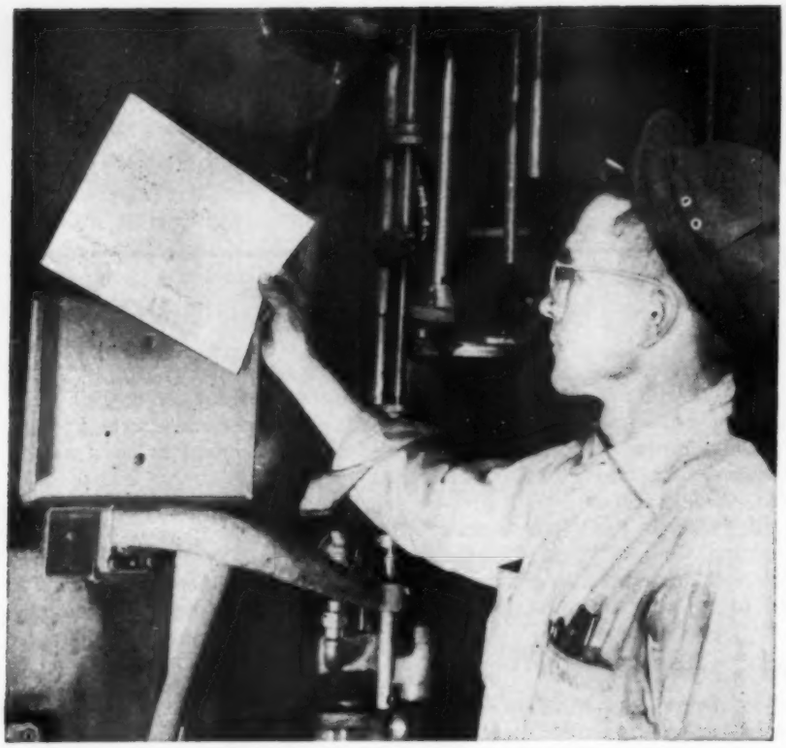
ULTRA-SENSITIVE linear measuring devices, capable of giving accurate readings to the millionth of an inch, have created new problems. Pressure of the gaging members themselves may cause distortion of the measured piece greater than the designated accuracy, or dust or temperature change may do it. Present need is a thermometer accurate to perhaps a tenth or an eighth of a degree Fahrenheit, so temperature at the gage can be measured and allowances made for variations in piece dimensions because of it. For example, a 1 F. temperature rise makes a 5-in. ring gage increase its diameter over 0.00003 in., or 30 times the desired accuracy of measurement.

To Mark Rubber

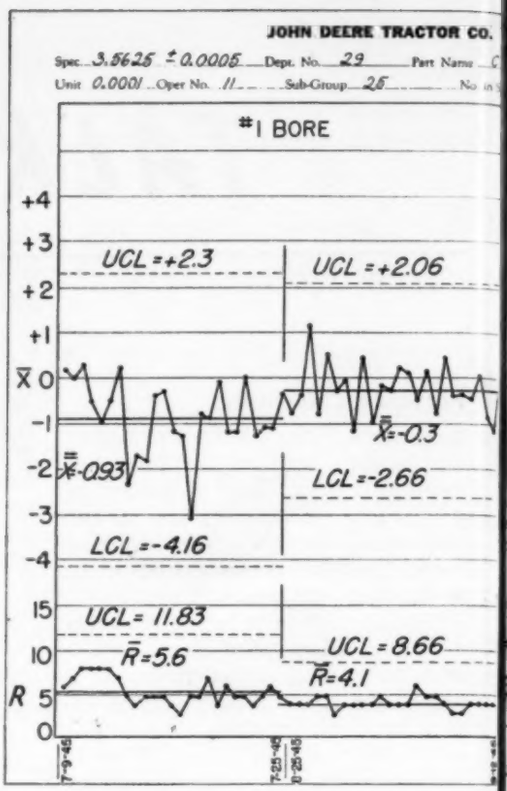
A NUMBER of different rubber compounds are used on an airplane, Beech Aircraft Corp., faced with the problem of marking these synthetic compounds for shop identification, tried colored paints. They wouldn't stick to rubber—and the tube forms persisted in getting mixed. C. L. Grice, whose job it was to identify them correctly, solved the problem with colored rubber cement. It sticks and doesn't crack.

Rail Change

FUTURE railroad rail will have changed cross-section, according to Walter Leaf, research man for the Denver & Rio Grande Western RR. at the ASME Fall Meeting in Salt Lake City. A 112-lb. rail on the D. & R.G.W. in 1940 developed a web rupture and the rail broke in two. 29 adjacent rails were found with similar cracks. As a result, the railroad developed a new section. Now, AAR has adopted three sections like it as standard (41.8% of rail failures between 1935 and 1944 were in the web). In effect, the web is turned upside down and thickened.



Control charts, placed in holders on each machine, are kept up to date by patrol inspectors each time a sub-group of parts is checked. Operators and production supervisors can see progress at a glance



Two parallel bores in the cylinder block must be held within 0.0005 in. of specified diameter. $\overline{X}$ and R data for both bores on the same chart simplified

COMMON-SENSE QUALITY CONTROL..2

Patrol inspection, combined with established control and reject procedures, insures that corrective action will be taken

BY EARNEST L. FAY

CHIEF INSPECTOR, JOHN DEERE TRACTOR COMPANY

QUALITY CONTROL at the Waterloo plant has been designated, for internal reasons, as the "Manufacturing Specification Control" program. Its activities are supervised by an assistant chief inspector whose duties parallel those of the assistant chief inspector in charge of normal inspection activities.

The plant is divided into three divisions for inspection control purposes. In each division, the general inspection supervisor in charge has dual responsibility for normal inspection and manufacturing specification control inspection activities. Reporting to him are shift departmental inspection supervisors, who also have the same dual responsibilities.

For economy, inspectors in small work centers within departments sometimes also have dual responsibility for normal and patrol inspections. This, however, is the exception, as each activity requires somewhat different personal attributes and training.

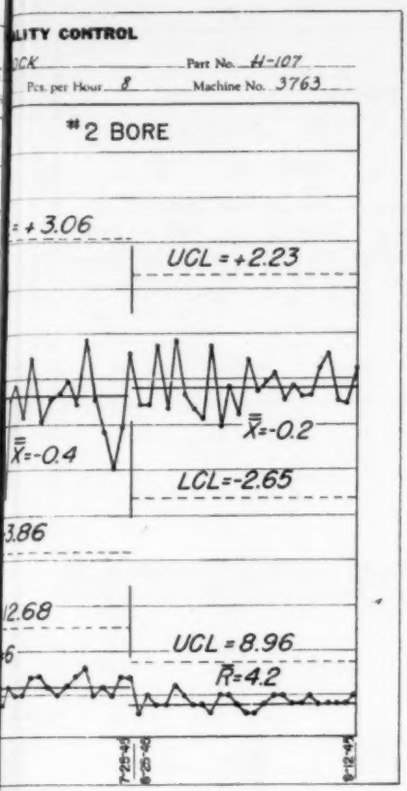
When manufacturing specification control has been set up for a given operation, inspection is made of a specified number of random samples selected from each sub-group of parts processed. All pieces produced while setting up the machine to make parts conforming to drawing specifications are 100% inspected. Quality control does not operate until the machine is set to make parts on a production basis.

Quality requirements, production rate and running quality level determine the size of each sub-group, frequency of patrol inspections, number of random samples to be taken at each inspection and the type of control chart to be used in each case.

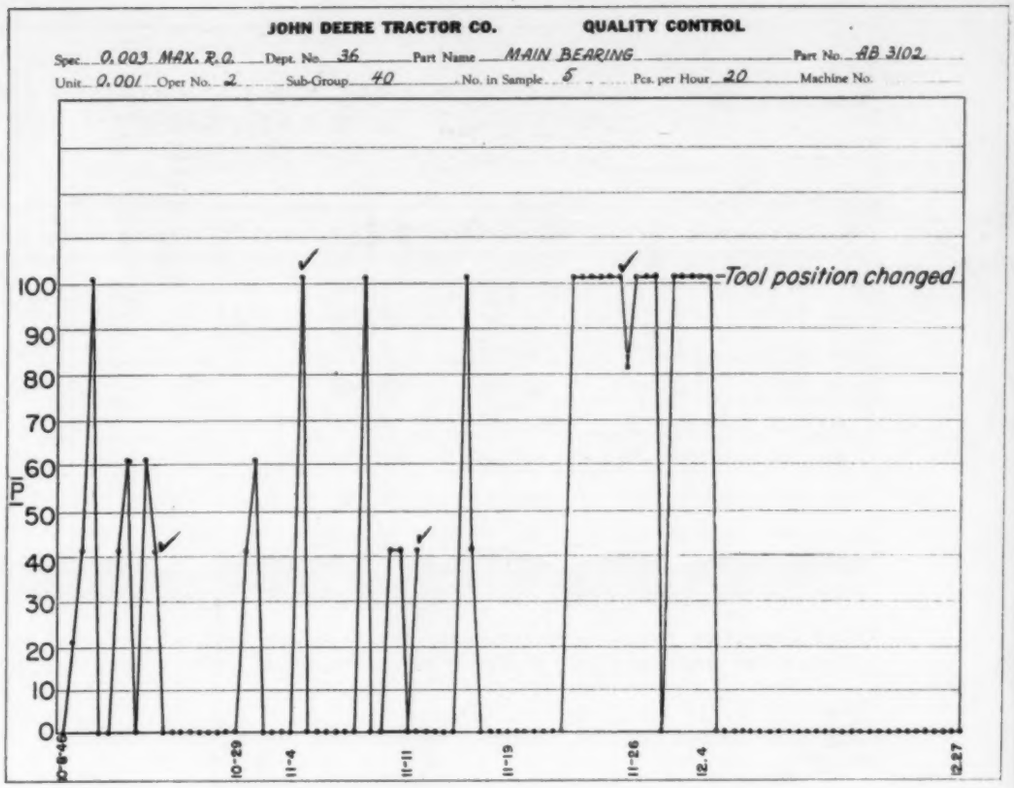
Usually, $\overline{P}$ (attribute or percent defective) charts are employed for recording inspections on operations where normal production is being attained without difficulty and where no dimensions need be held closer than about 0.003 in.

Conventional $\overline{X}$ and R (average and range) charts are used when close dimensional tolerances must be held, and are started when a $\overline{P}$ chart indicates that some characteristic is out of control. Only $\overline{X}$ and R charts are of help when there is need to analyze and correct production difficulties.

A standard data sheet is made up for each chart, so results of each inspection can be recorded. Such records are as essential as the charts when a historical analysis must be made of an operation. In each case, data sheets are attached to the



nalysis of difficulties encounterd in nishing these bores. Tool improvement made possible the closer control dicated between the two time periods



$\overline{P}$ chart for main bearings shows check marks to indicate when rejection notices were sent to the department foreman. When the cause of trouble was discovered and tool position changed, no further trouble was experienced

charts at all times for easy review when necessary.

A manufacturing specification control file is maintained in each inspection center. Here are filed control charts and their accompanying data sheets when the charted operations are not in production. A separate chart is maintained for each operation performed on each machine. When the same operation may be done on several machines, separate charts are maintained as charts check the machine as well as the work produced.

Control Procedures

When an operation is set up, the patrol inspector places in a holder mounted on the machine the proper control chart from his file. After checking and accepting the pieces run during setup, he starts control inspection on the operation. As sub-group size, random inspection sample size and frequency of sub-group inspection have been pre-determined, the operator has only to accumulate sub-groups between each visit of the patrol inspector.

A sub-group, made up of pieces produced between patrol inspections, is usually accumulated in tote pans, baskets or racks. But when parts are large, such as axles, brake housings and main bearings, and separation in containers is out of reason, accepted pieces may be marked with chalk by the inspector. Thus all unmarked pieces make up the next sub-group.

Results of each patrol inspection must be recorded on the data sheet and plotted on the accompanying chart. Dates of each run are shown on the bottom of each chart, so several non-consecutive runs of the same part in the same machine may be recorded on a given chart. The result is the same as if the production run for the part were continuous.

Plotted results determine the disposition of each sub-group. On $\overline{X}$ and R charts, plottings for average size must be between the upper and lower control limits and plottings for range must be below the range upper control limit line on the chart, or the sub-group is rejected and must be 100% inspected. Where a $\overline{P}$ chart is used, a rejected piece found in the random sample causes rejection of the sub-group and 100% inspection of the sub-group.

Usually the size of the sub-group is allowed to vary 20% either way, so the patrol inspector can plan his inspection scehedule through a department without backtracking several times to be at given machines at the time a specified sub-group quantity is completed. On simple parts where patrol inspections are made by sampling fairly large sub-groups, we usually include in each random sample of the sub-group the *last* piece produced to get a more accurate check on the tools.

Frequency of patrol inspection, quantity of parts in each sub-group and type of control chart employed can be changed by the inspection supervisor in the department. Such changes are noted on the charts.

When quality consistently is good, frequency of patrol inspections can be reduced. Conversely, production difficulties call for more frequent inspections and smaller sub-group quantities. Normally, random-sample size is held at five or ten pieces while the size of the sub-group is varied according to the inspection history of the operation.

On completion of an operation, the control chart and its accompanying data sheet are removed from the machine by the patrol inspector and held at his desk to be picked up in lots twice weekly for delivery to the central inspection office. Here they are analyzed and, when desirable, new upper and lower control limit lines are calculated and plotted. They then are sent to the departmental inspection supervisor for

M2582-10M-1-46

JOHN DEERE TRACTOR CO. QUALITY CONTROL
$\overline{X}$ - R DATA SHEET

SHEET No. 1 PART NAME LEFT GOV. BRG. HSG. PART No. A-41

SPEC 2.0795 ±0.0005 OPERATION No. 2 MACH. No. 2168

No. IN SAMPLE 10 SUB. GROUP 50 UNIT 0.0001 PCS. PER HR. 100 DEPT. No. 26

NO.	A		B		C		D		E		$\overline{X}$	R	REMARKS
1	+2	+4	-1	+1	0	+2	-2	+3	+1	-1	+0.9	6	4-17-45
2	+1	-2	-7	-2	-5	-1	+1	-3	-1	-3	-2.2	8	
3	-1	-3	+1	-2	+5	-2	+2	-2	-4	-2	-0.8	9	
4	+2	0	-3	+2	+1	-5	+1	-1	0	-2	-0.5	7	
5	-6	-1	+2	-1	-6	-2	-5	+1	-3	-1	-2.2	8	
6	-1	-3	+3	-4	-3	-6	0	-2	+2	-2	-1.6	9	
7	+1	-2	-3	-7	-2	+1	+2	-2	-1	+1	-1.2	9	

Patrol inspectors record inspection data for each sub-group on this form for $\overline{X}$ and R control charts. Designed for sample lots of five parts per sub-group, entries for lots of ten parts indicate how larger samples are recorded

filing until needed again at the machine.

Sub-group Rejection

Should a sub-group be rejected by a patrol inspector, this fact is noted on the chart by circling the plotting for the reject and by recording the results of the 100% inspection on the reverse side of the chart. This note must state the number of pieces inspected in the sub-group, the number of pieces defective (including those in the random sample) and the reasons for rejection. Normal inspection procedures and engineering judgment determine whether parts so screened as defective can be used, reworked or must be scrapped.

Defective material or parts cannot be further processed until defects are corrected. There is no permissible level of defects in our manufacturing specification control system. This is expensive, but necessary to eliminate fitting on the assembly floor and to insure high quality of products shipped to customers.

At the end of each production line, sub-groups are accumulated and each lot of parts then must pass a 10% random sample inspection before it can be moved to the next department or to stores. If any defects are found in this reinspection operation, normal inspection procedures are followed—in many cases the accumulated lots must then pass a 100% inspection for screening out defective parts.

Rejection of a sub-group by a patrol inspector normally is called to the attention of his supervisor immediately. It then rests with the supervisor to determine when a reject notice should be sent to the responsible foreman to notify him of a condition that requires attention. In case the foreman does not take action, a second reject notice is sent to him.

The third notice goes to the general foreman if action still is delayed. Should there be no corrections as a result of this notice, a fourth rejection notice is prepared for the attention of the superintendent in charge of the production division. This notice is routed through the inspection office for review by the chief inspector or one of his assistants before delivery with the control chart and its accompanying data sheet. Fifth step is to route a rejection notice to the production superintendent, again through the office of the chief inspector. Few such notices are necessary, as corrections generally are made long before such action is needed.

Complaint sheets are made up by the assistant chief inspector, responsible for manufacturing specification control, from assembly-line reports of complaints or rejects and from reports turned in by the scrap inspector. They are sent to departmental inspection supervisors for report of action taken.

QUALITY CONTROL REJECT NOTICE

NAME OF PART IDLER GEAR PART No. 761CH

DEPT. No. "A" MACH. No. 2641

REASON Broached hole oversize

1.250 ± 0.001 Avg 1.252

NOTIFICATION	DATE AND TIME	BY INSPECTOR
1. FOREMAN John Doe	12-12-46 - 9 a.m.	Smith
2. FOREMAN John Doe	12-12-46 - 10 a.m.	Smith
3. GEN. FOREMAN P. Jones	12-12-46 11 a.m.	Smith
4. DIV. SUPT. D. Brown	12-12-46 1 PM	Smith
5. PROD. SUPT. Joe Blow	12-12-46 2 P.M.	Baker

M2564-150 Hkz.-2-46-Trac. Co.

Reject notices, sent by the inspection department, notify production supervisors of jobs on which difficulties are being experienced. If no corrective action is taken after two such notices, the third is sent to the general foreman, fourth to division superintendent and fifth to production superintendent. Few notices need be brought to the attention of either superintendent

M2883 10M-6-46

JOHN DEERE TRACTOR CO. QUALITY CONTROL
$\bar{P}$ - DATA SHEET

PART No. AB-3102

SHEET No. 1 PART NAME RT. MAIN BRG. W/INSERT OPERATION No. 2 MACH. No. 454

No. IN SAMPLE 5 SUB. GROUP 40 PCS. PER HOUR 20 DEPT. No. 36

NO.	NO. PCS. CHECKED	NO. DEFECTIVE	% DEFECTIVE	REASON FOR REJECT
1	5	–	–	10-18-46
2	5	1	20	MORE THAN 0.003 R.O.
3	5	2	40	10-21 MORE THAN 0.003 R.O.
4	5	5	100	10-22 MORE THAN 0.003 R.O. – ROUGH FINISH
5	5	–	–	
6	5	–	–	
7	5	2	40	0.004 R.O. ON O.D.

Data sheets for $\bar{P}$ charts have space for recording reasons for any rejections made when checking a sub-group. Percent defective is calculated on this sheet by the patrol inspector before plotting data on the control chart

Such complaint sheets keep patrol inspectors and their supervisors on their toes. Parts cannot be delivered "on chance" without a strong possibility that explanations will be requested later.

Frequent checks are made of the operation of the manufacturing specification control system to insure its high efficiency. A special investigator employed by the inspection department checks the operation of the system in individual departments at frequent intervals. His reports to the chief inspector are recorded on a standard form which also reports troublesome items and suggested remedies that will improve the efficiency of the inspection department.

Patrol inspectors are not permitted to give orders to machine operators for the correction of conditions considered wrong. We believe that corrective measures are the responsibility of production supervisors, who are responsible for all production processes. Control charts, placed on the machines in full view of the operators, are so positioned that production supervisors can see them when passing and determine at a glance how the work is progressing.

In our relations with these supervisors, we emphasize that charts by themselves will neither correct any undesirable conditions nor maintain a state of control. They only present evidence on which to base decisions and, if properly followed, will indicate what improvement has been made at each stage of correction. But when corrections are necessary, they must be made on the job, not on the charts.

No. 10

MANUFACTURING SPECIFICATION CONTROL

Complaint Sheet No. 380 Date 1-22-47

Part Name GLAND Part No. B-2037

TO E. BROWN

COMPLAINT:
SCRAP WARRANTS
325 pieces drilled off center

Do we have chart on this part? Yes Kind of Chart $\bar{X}$ ( ) $\bar{P}$ ( )

Sample Size 10 Sub-Group Size 520

Does chart show condition of above complaint? Yes

Answers required if this is a Line Complaint:
Do we 10% inspect at Final Inspection before releasing?
Records show this material was released by
Inspector was notified of this complaint Yes ( ) No ( )

This Complaint investigated by E. BROWN

Results of Investigation:
Spot drilled off center all in one group. Caught by Patrol Check.

Action taken to eliminate future complaints:
If trouble is not corrected, will give reject notice

Production Personnel contacted BAMSELL

Part Machined in Department 34 Signed E. BROWN

On Machine No. 4154 Date 1-27-47

Excessive scrap is traced with copies of complaint reports. Inspection supervisors, on receipt of complaint form from the inspection office, must explain why parts were passed if the form were issued as a result of an assembly-line complaint, or why excessive scrap was delivered to the scrap inspector

M2582 10M-1-46

JOHN DEERE TRACTOR CO. QUALITY CONTROL
$\bar{X}$ - R DATA SHEET

SHEET No. 1 PART NAME LEFT GOV. BRG. HSG. PART No. A-41

SPEC 2.0795 ±0.0005 OPERATION No. 2 MACH. No. 2168

No. IN SAMPLE 10 SUB. GROUP 50 UNIT 0.0001 PCS. PER HR. 100 DEPT. No. 26

NO.	A		B		C		D		E		$\bar{X}$	R	REMARKS
1	+2	+4	-1	+1	0	+2	-2	+3	+1	-1	+0.9	6	4-17-45
2	+1	-2	-7	-2	-5	-1	+1	-3	-1	-3	-2.2	8	
3	-1	-3	+1	-2	+5	-2	+2	-2	-4	-2	-0.8	9	
4	+2	0	-3	+2	+1	-5	+1	-1	0	-2	-0.5	7	
5	-6	-1	+2	-1	-6	-2	-5	+1	-3	-1	-2.2	8	
6	-1	-3	+3	-4	-3	-6	0	-2	+2	-2	-1.6	9	
7	+1	-2	-3	-7	-2	+1	+2	-2	-1	+1	-1.2	9	

Patrol inspectors record inspection data for each sub-group on this form for $\bar{X}$ and R control charts. Designed for sample lots of five parts per sub-group, entries for lots of ten parts indicate how larger samples are recorded

filing until needed again at the machine.

Sub-group Rejection

Should a sub-group be rejected by a patrol inspector, this fact is noted on the chart by circling the plotting for the reject and by recording the results of the 100% inspection on the reverse side of the chart. This note must state the number of pieces inspected in the sub-group, the number of pieces defective (including those in the random sample) and the reasons for rejection. Normal inspection procedures and engineering judgment determine whether parts so screened as defective can be used, reworked or must be scrapped.

Defective material or parts cannot be further processed until defects are corrected. There is no permissible level of defects in our manufacturing specification control system. This is expensive, but necessary to eliminate fitting on the assembly floor and to insure high quality of products shipped to customers.

At the end of each production line, sub-groups are accumulated and each lot of parts then must pass a 10% random sample inspection before it can be moved to the next department or to stores. If any defects are found in this reinspection operation, normal inspection procedures are followed—in many cases the accumulated lots must then pass a 100% inspection for screening out defective parts.

Rejection of a sub-group by a patrol inspector normally is called to the attention of his supervisor immediately. It then rests with the supervisor to determine when a reject notice should be sent to the responsible foreman to notify him of a condition that requires attention. In case the foreman does not take action, a second reject notice is sent to him.

The third notice goes to the general foreman if action still is delayed. Should there be no corrections as a result of this notice, a fourth rejection notice is prepared for the attention of the superintendent in charge of the production division. This notice is routed through the inspection office for review by the chief inspector or one of his assistants before delivery with the control chart and its accompanying data sheet. Fifth step is to route a rejection notice to the production superintendent, again through the office of the chief inspector. Few such notices are necessary, as corrections generally are made long before such action is needed.

Complaint sheets are made up by the assistant chief inspector, responsible for manufacturing specification control, from assembly-line reports of complaints or rejects and from reports turned in by the scrap inspector. They are sent to departmental inspection supervisors for report of action taken.

QUALITY CONTROL REJECT NOTICE

NAME OF PART IDLER GEAR PART No. 761CH

DEPT. No. "A" MACH. No. 2641

REASON Broached hole oversize

1.250 ± 0.001 Avg 1.252

NOTIFICATION	DATE AND TIME	BY INSPECTOR
1. FOREMAN John Doe	12-12-46 9 a.m.	Smith
2. FOREMAN John Doe	12-12-46 10 a.m.	Smith
3. GEN. FOREMAN P. Jones	12-12-46 11 a.m.	Smith
4. DIV. SUPT. D. Brown	12-12-46 1st PM	Smith
5. PROD. SUPT. Joe Blow	12-12-46 2 P.M.	Baker

AF2868-150 Bkn.-2-46-Trac. Co.

Reject notices, sent by the inspection department, notify production supervisors of jobs on which difficulties are being experienced. If no corrective action is taken after two such notices, the third is sent to the general foreman, fourth to division superintendent and fifth to production superintendent. Few notices need be brought to the attention of either superintendent

M2882 10M-6-46

JOHN DEERE TRACTOR CO. QUALITY CONTROL
$\overline{P}$ - DATA SHEET

PART No. AB-3102

SHEET No. 1 PART NAME RT. MAIN BRG. W/INSERT OPERATION No. 2 MACH. No. 454

No. IN SAMPLE 5 SUB. GROUP 40 PCS. PER HOUR 20 DEPT. No. 36

NO.	NO. PCS. CHECKED	NO. DEFECTIVE	% DEFECTIVE	REASON FOR REJECT
1	5	–	–	10-18-46
2	5	1	20	MORE THAN 0.003 R.O.
3	5	2	40	10-21 MORE THAN 0.003 R.O.
4	5	5	100	10-22 MORE THAN 0.003 R.O. – ROUGH FINISH
5	5	–	–	
6	5	–	–	
7	5	2	40	0.004 R.O. ON O.D.

Data sheets for $\overline{P}$ charts have space for recording reasons for any rejections made when checking a sub-group. Percent defective is calculated on this sheet by the patrol inspector before plotting data on the control chart

Such complaint sheets keep patrol inspectors and their supervisors on their toes. Parts cannot be delivered "on chance" without a strong possibility that explanations will be requested later.

Frequent checks are made of the operation of the manufacturing specification control system to insure its high efficiency. A special investigator employed by the inspection department checks the operation of the system in individual departments at frequent intervals. His reports to the chief inspector are recorded on a standard form which also reports troublesome items and suggested remedies that will improve the efficiency of the inspection department.

Patrol inspectors are not permitted to give orders to machine operators for the correction of conditions considered wrong. We believe that corrective measures are the responsibility of production supervisors, who are responsible for all production processes. Control charts, placed on the machines in full view of the operators, are so positioned that production supervisors can see them when passing and determine at a glance how the work is progressing.

In our relations with these supervisors, we emphasize that charts by themselves will neither correct any undesirable conditions nor maintain a state of control. They only present evidence on which to base decisions and, if properly followed, will indicate what improvement has been made at each stage of correction. But when corrections are necessary, they must be made on the job, not on the charts.

No. 10

MANUFACTURING SPECIFICATION CONTROL

Complaint Sheet No. 380 Date 1-22-47

Part Name GLAND Part No. B-2037

TO E. BROWN

COMPLAINT:
SCRAP WARRANTS
325 pieces drilled off center

Do we have chart on this part? Yes Kind of Chart $\bar{X}$ ( ) $\bar{P}$ ( )

Sample Size 10 Sub-Group Size 520

Does chart show condition of above complaint? Yes

Answers required if this is a Line Complaint:
Do we 10% inspect at Final Inspection before releasing?
Records show this material was released by
Inspector was notified of this complaint Yes ( ) No ( )

This Complaint investigated by E. BROWN

Results of Investigation:
Spot drilled off center all in one group. Caught by Patrol Check.

Action taken to eliminate [illegible] complaints:
If trouble is not corrected, will give reject notice

Production Personnel contacted BAMSELL

Part Machined in Department 34 Signed E. BROWN

On Machine No. 4154 Date 1-27-47

Excessive scrap is traced with copies of complaint reports. Inspection supervisors, on receipt of complaint form from the inspection office, must explain why parts were passed if the form were issued as a result of an assembly-line complaint, or why excessive scrap was delivered to the scrap inspector

Scrap Reduction Gains Recognition

BY JAMES K. MATTER, PIONEER ENGINEERING & MANUFACTURING CO.

Introducing a series on cost reduction, the scrap problem is treated first as the logical attack point for quick results

SCRAP—and its twin brother, rejects—are the White Man's Burden in any manufacturing business. By scrap is meant spoiled work, not trimmings, punchings or turnings.

No matter how far removed from manufacturing details top-management men may be, there is one word they understand thoroughly—scrap. I have managed plants for presidents who never could begin to fathom the intricacies of an elaborate cost accounting report, but they could always pick out a few figures that would make me unhappy; the one most often heard from was entitled scrap.

Scrap Down, Costs Down

Of all the many methods of reducing cost in shop or plant, there is none more prolific of gratifying results than that of scrap reduction. The tool engineer that aspires for recognition and advancement will, if he is smart, keep that one thought in the front of his mind.

If an engineer is going into a strange plant to work on cost reduction or tool processing, it will pay him to investigate the scrap problem immediately. There is no subject that costs less to look at or pays higher dividends if a solution or partial solution is found. That is one advantage of tackling the scrap problem: One need not lick the whole subject, as even a good attack will gain favorable recognition.

It will not at any time be necessary to introduce the subject of scrap to any major business executive; he has already met it. No one likes scrap, but management of any company has a natural liking for anyone that can do something about it.

And scrap can be tamed! It is the purpose of this article to indicate a methodical means of handling it.

Harvey Firestone built up and managed a great industrial empire with the aid of just one question: "Is this necessary?"

If anyone asked for an appropriation to build a new wing, to erect an additional plant or to install a new department, he mentally tested the matter by asking himself, "Is this necessary?"

Few things in life are necessary. Most requests for expansion, or for more men or for most anything, are expedient, but not necessary. Expediency does not mean the same thing as necessity!

Is scrap necessary? Is it possible to manufacture a product without producing scrap?

Under present conditions, it is not possible to manufacture any paying product that I have ever heard of without producing some rejects and some scrap. But the modern tool engineer, working with modern tools and knowledge, can keep the scrap pile whittled down to a pile that can be explained, not confessed.

In hundreds of well-managed plants, average scrap runs from ½ to 3% of the product, either in number of parts made or in dollars and cents value.

Scrap Problem Investigation

It is an axiom, realized by few, that if one wants to go any place it is first necessary to decide on a destination. It is also an axiom, again realized by few, that to go anywhere, one must start from his present location and status. So to investigate the scrap problem in any plant means finding out what and how scrap is produced, analyzing the reasons and determining the scrapping point and solution.

Products may be classified as:

1. Assembled job: Radios, automobiles, trucks, locomotives, guns—products assembled from many component parts.

2. Single unit: Cooking utensils, shovels, rakes, stampings, castings—products made from only one or several parts.

3. Bulk products: Films, sensitized paper, oil and many others.

There is no scrap in the first class; that is, automobiles may be rejected and individual parts scrapped, but the entire machine is never scrapped. In the second class, there is plenty of scrap. In the third class, the scrap, at times, is extremely high.

Determine Normal Scrap

After deciding on which class the product belongs in, the next step is to search handbooks and current technical magazines, to consult the technical libraries and to find out what percentage of scrap is considered normal in the industry. An exact, comparable prototype that matches the product may not be found, but a close parallel is usually available.

Then a wise move is to consult the chief cost accountant and find out what he thinks about the scrap problem. As the chief cost accountant of any plant is one man who knows where the money is being spent, he knows more about scrap than the men who make it, and what he doesn't know he fears.

He knows scrap percentages and, in many cases, he knows why scrap is being made. It is not his job to correct troubles, so it is unfair to expect him to do so but he can, and will, advance worthwhile suggestions on the problem.

Recently, I discussed a scrap problem with the chief cost accountant of a concern manufacturing sensitized photographic paper. Management said scrap was 5%. The cost accountant proved it was 25%.

Scrap was particularly high on certain classes of paper and on only cetrain sizes of this paper. In an effort to offset this scrap, management had instituted a series of elaborate recutting and reinspection operations —in other words, salvage.

Salvage cost was more than the cost of running the plant. To cover up that fact management was trying to induce the cost-accounting department to accept the cost of salvage labor as direct labor expended on the product.

The paper-plant management's reasoning in this case was fallacious. This illustrates well that the chief cost accountant always knows facts the tool engineer should know before he plans his own program.

A Case Study

In a large concern manufacturing engine parts and other products, I was given a certain part to survey and determine what could be effected in cost reduction. The part was chosen partly at random and partly because about 200 parts of the same class, but not of the same size, were being manufactured.

First, I looked up the chief cost accountant and obtained all available costs and scrap costs, not of the entire 200 models, but of the 3 models manufactured in largest quantities. I found out in a hurry that the plant was operating on so-called standard costs.

Exact costs of the parts were not known and were not even being collected. A working cost had been set up and had been based on the cost of other parts made in the past, but not this part. The chief cost accountant feared the worst and his fears were entirely justified. Available scrap costs showed that parts were costing ten times the value at which they were being carried on the books.

With that information, I inspected the foremen's daily and weekly scrap records. The scrap was terrific. The men had heard so much about it that they were hiding spoiled pieces under the benches and denying they had ever seen them.

With this preliminary information, the next move was to analyze the reasons for scrap. Daily scrap records for a month were charted, listing model number, date, day or night shift, operator's name, inspector who authorized the scrap, reason for scrap, operation number at which part was scrapped and type of machine on which scrap was made.

One of the first discoveries was that all scrap was authorized by three inspectors and that 92% was condemned by one man. That lead looked good, but it then developed that the night shift culled out suspected parts and held them for the day inspector to condemn officially. Reports that went to the office showed a high scrappage on the day shift and little scrap on the other shifts. This fact was interesting to management, but of no value to me for determining reason for scrapping.

I then looked up each inspector and spent some time with each one. The real facts were now beginning to appear. Parts that were being scrapped were made from either forgings or bar stock. Each part required an average of 95 separate operations.

Each part had two connecting holes drilled in it. The holes were ⅛ in. in dia. and from 4 to 12 in. deep. One hole was drilled at the sixth operation, but the other hole was not drilled until the ninety-first operation.

The second hole was drilled at an angle and had to meet the first hole squarely and not overrun it by more than 0.010 in. Parts were being scrapped because the second hole was running out and not meeting the first hole properly.

The job itself was difficult. Add to that an incentive wage rate and the pressure on the production department to get parts out, it was easy to see why scrap was high.

Locate Scrapping Point

This emphasizes another point a tool engineer must always consider —*look for the scrapping point.* In a large majority of spoiled parts, close study of the records will show that parts are spoiled on certain operations, so it is desirable to put the part through the scrapping operations as early as possible.

This can not always be done, but if the tool engineer keeps the scrapping point in mind when he processes, reprocesses or shoots trouble, before long he will find that his scrap record has improved tremendously.

In this example, the scrapping point has been determined. A large number of parts were being scrapped on the ninety-first operation. As parts had an average of 95 operations on each one, by the time the part was scrapped the value of labor and burden in it was high.

The next question was, "Why not put the scrapping operation in first?" An investigation showed that the troublesome operation was the ninety-first operation because it had been processed that way, parts had always been made that way and parts were tooled that way.

Analyze Process Conditions

Many attempts had been made to correct the operation, but no one had attempted to correct the process. We now carefully reviewed the whole subject in the light of conditions now known.

Drilling of the holes themselves in straight lines, and to very close runout tolerances, was a difficult job at best. It was an operation that should be done on a machine not now available, an upside down drilling machine with various adjustments. We did find out that we could reprocess the job and put the scrapping point in as the twelfth operation provided we retooled the part. The value of the part at the twelfth operation was $4.18, and at the ninety-first operation was $28.64. The difference in cost justified the expense of retooling the part and the change was made. Results have been so gratifying that some other parts will be retooled on the same basis.

There are thousands of ways of making scrap, and there are thousands of ways of correcting and controlling that scrap. But all these problems can be tackled by this definite and little known method of "watching the scrapping point."

It is true that, in processing a new part, one cannot always forecast the operation that will result in spoilage and scrap. It is also true that few tool engineers give the scrapping point any consideration.

To Increase Batting Average

If the thought of that point is kept definitely in mind, watched for, and the tooling corrected as soon as the trouble point is discovered, the engineer's batting average against scrap is going to rise definitely and rapidly.

It matters not whether a product is part of an automobile, a hammer, or ten pins, a logical campaign in the interests of scrap reduction should follow this path:

1. Investigate—get available figures and costs.
2. Analyze reasons for scrap.
3. Determine scrapping points.
4. Reprocess, retool and correct.

Too Much Initiative?

BY JOHN HOMEWOOD

TEX, one of the operators turning out shell blanks, was having trouble with the roller chuck gripping the shell nose while he was cutting the wavy ridges which prevent the copper rotating band from turning. The wandering trouble-shooter didn't help him much. Now, Tex had that rare characteristic which some foremen greatly appreciate: initiative. This is a commendable trait, but when it overflows its banks it is likely to result in a flood.

Tex's previous job was as a brakeman on a branch line out in the Lone Star state. Tex had seen the effectiveness of sand for preventing locomotive driving wheels from slipping. Tex was in great fear of spoiling his work, but didn't want to be considered too much a nuisance, so he took matters into his own hands.

Some time later the foreman came around. "They don't slip now!" Tex smiled, triumphantly, as he shoved another nose up to the shoulder. "I packed her up with some of that gray sand from the polishing department."

It was one foreman's custom to get to the plant early enough in the morning in order to check up on the night shift just as they were getting ready to quit. He was met at the door by a short, stocky lathe hand who ran the roughing lathe. The operator had been having trouble throughout the night; he ran into a very hard batch of forgings the chips from which peeled off with a suffering ring of blue. "This batch of forgings are so hard you'll have to heat 'em 'fore you turn 'em." There was initiative, with a vengeance!

Occasionally, a shell was tapped out too large, permitting the no-go gage to enter for several threads. These were rejected. One aggressive tool man saw fit to exercise his own initiative by securing a block of 8x8-in., 0.60-carbon steel and turned out a swaging die. After repeated trials he called the foreman over. He placed the die on the anvil of the large steam hammer, spread grease over the inside, and, with a wink, inserted the nose of the shell. He oscillated the operating lever, approaching closer and closer to the shell base. He had rehearsed this exhibition of control and could have touched the face of a watch without damage. But, this time, the hammer came down with unrestrained force, shoving the shell nose deep enough into the die to transform the 2-in. dia. thread into one about half its size. The boss sought solace elsewhere.

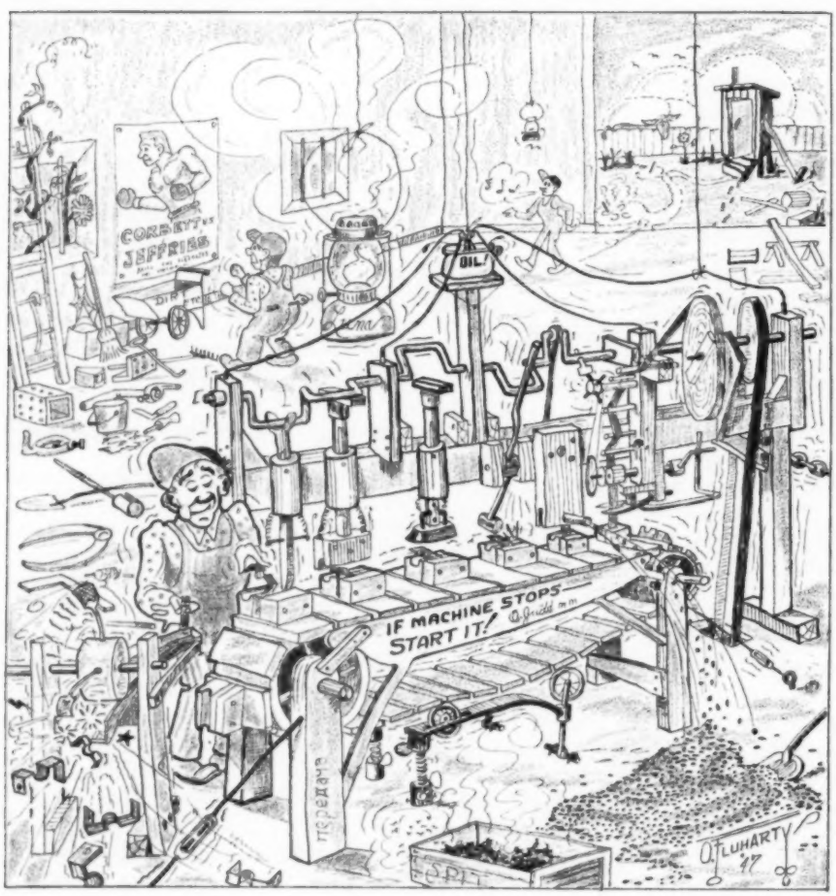
This fellow was gifted with persistence. Convinced that his idea had merits, he again applied the coating of grease and inserted another shell. He looked up at the steam hammer and scratched his head. Discretion (another valuable trait) came to the fore as he placed a block of hard wood on the base of the shell and gave it a gentle tap with the sledge. The nose was closed to exact dimensions.

Inasmuch as the instruction sheet did not say anything about shells being brought back into circulation with a light tap on the base, the chief inspector asserted his official objections.

Not to be discouraged, our ingenious one sought to overcome the inspector's objection. His persistence was augmented by secretiveness. He cut an 18-in. square hole in the 2-in. flooring, placed his favorite swaging block just below floor level, and covered it with a square of flooring. When inspectors were out of range, he lifted the cover and exposed the block for a few minutes of legitimate resurrection. Any pains in his conscience were considerably relieved when orders came from headquarters to pass anything that would go through the barrel of a gun.

OUR SHOP. . . 29

Precision Forming Dept.



Fitting Carbides to Small Tools

BY JAMES SAFHILL
Tool Designer
ERICSSON TELEPHONES LTD.

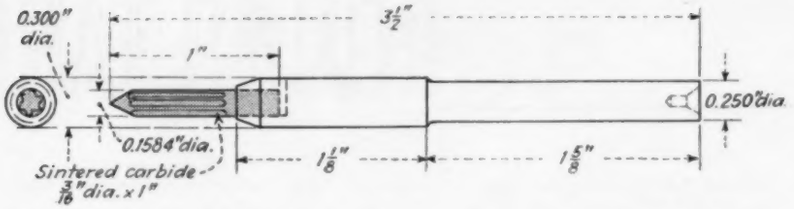
Applying carbides to tools for extremely small telephone parts requires care, proves its worth

EXTREMELY small parts manufactured in the Ericsson Telephone Plant, Beeston, England, have required special treatment in the production of carbide tools and gages. When occasion demanded, tools have been made from solid pieces of carbide with the required form ground straight on to the hard metal.

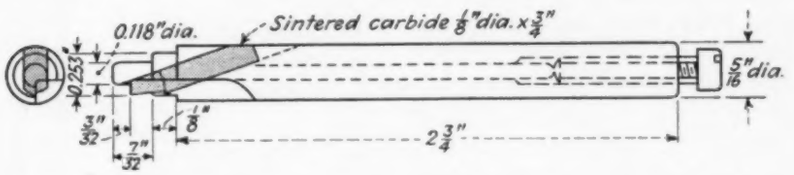
Several examples of such tools are shown here. All have given outstanding service. The drill gives ten times the service between grinds.

A high-speed steel counterbore for counterboring three holes in a Bakelite telephone body machined 15 cases before it required regrinding. The carbide cutter makes it possible to machine 300 cases per grind.

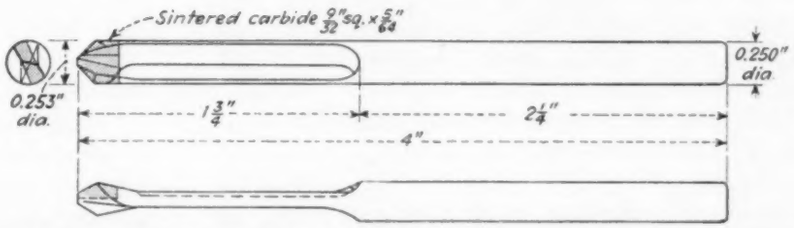
In another counterboring operation, ten 0.454-in. dia. holes are counterbored to a depth of 0.597 in. in an ebonite block. High-speed steel tools had to be sharpened after every 15 blocks. The carbide cutter machines 150 blocks per grind. The amount of scrap resulting from dull tools and constant resetting has also been greatly reduced.



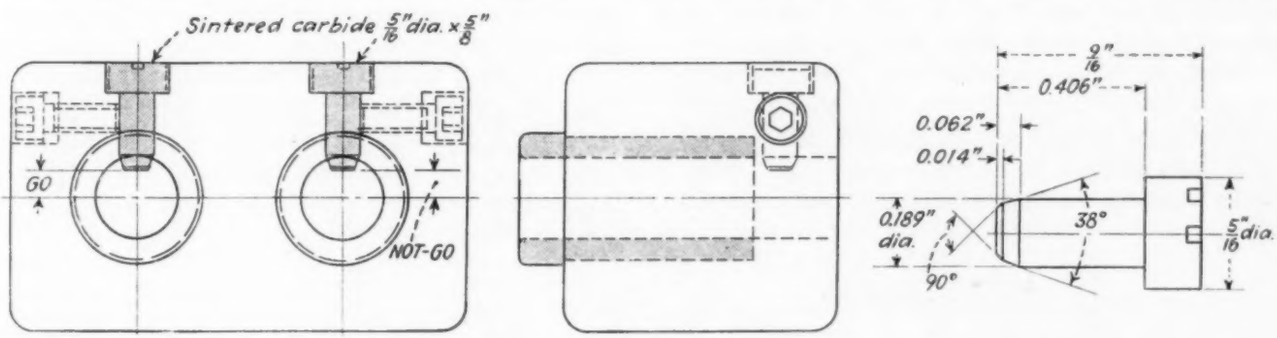
REAMER for 0.1584-in. dia. hole in a phosphor-bronze bushing has a Silver-Steel shank. The shank was turned to within a few thousandths of required diameter and centered. It was then reversed in the collet and drilled to take a 3/16-in. dia. by 1-in. long piece of carbide which was brazed in position. With a 60° external center ground on the carbide, the reamer was mounted between centers and all diameters ground to size. Six flutes were ground on a Barber-Colman cutter grinder with a 3-in. dia. diamond lap



COUNTERBORES are made by grinding required cutting angles on a piece of carbide inserted at an angle (usually 45°) in a Silver-Steel shank. The tip is locked in place with a rod and suitable screw



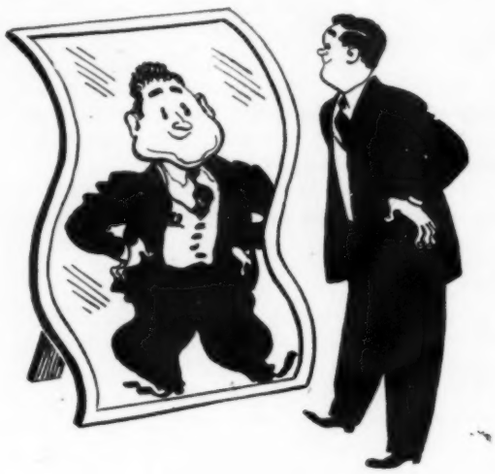
STRAIGHT-FLUTED DRILL maintains limits of ±0.001 in. on a hole drilled in an ebonite tube. Using a Silver-Steel shank clearance for chips was machined, leaving a solid head at the end. The head was slotted and a carbide tip brazed in the slot. With the shank held in a collet the required diameter was ground on the tip. After cutting angles were ground, the surplus metal on the head (which had been left for strength during manufacture) was removed



GAGE FOR CHECKING a stainless-steel worm spindle has a mild steel block through which the worm is fed. Inserts check the dimension. With hardened-steel inserts, wear was so rapid that limits were soon lost. Carbide inserts held by hollow setscrews solved the difficulty. The inserts were ground on a No. 13 Brown & Sharpe universal grinder. The screw-driver slot for fine adjustmets was cut with a diamond slotting saw

ROUND TABLE

Rating or Ratting?



"Say, Al, what do you think of that employee-rating form they have been using the last six months?"

"Do you mean the one for salaried personnel, Ed?"

"Yeah, the one that you rate your salaried people on and the Old Man rates you, then calls you in for a conference and discusses it."

"I don't know, Ed. The idea is good, I like to know how I'm doing and have a chance to discuss my job progress with the boss."

"The part that I don't like, Al, is having on record what he thinks about my initiative, personality, application, etc.: after all, I don't see how he can measure those things and it is just one man's opinion."

"But after all, Ed, you do want your boss' opinion of your work—he plays a big part in your progress."

"If anyone wants to know how good I am, Al, why can't he just ask the boss? He doesn't need to have a rating sheet about my personality, initiative, and a lot of other stuff that doesn't have anything to do with how good a supervisor I am."

"I won't agree with you there, Ed. When I went in for my first interview about three months ago, I had the Old Man explain what all the factors meant. They do have some relationship to job success; and, another thing, he won't always be around to tell someone how good you are."

"Well, Al, I didn't like the way I was rated on some of those things. I told the Old Man so, too."

"That's the thing I like most about being rated on a form and not just in someone's head, especially when it means that every three months I get to discuss my work with the fellow that rates me. I know how I stand, and if the Old Man should be transferred or leave, my record is on file and someone new can't come in and say I have been doing a lousy job."

"You mean, if your record is good, they can't say that."

"Well, I mean my record is on paper and not in someone's head. I don't like criticism, Ed, any better than the next guy, but I am interested in getting ahead, so if someone can tell me how I can improve my operation I'll listen."

"Al, those things they rate you on are just a guess. If it was quantity or quality production, O K. But supervisory ability and such things are just opinions."

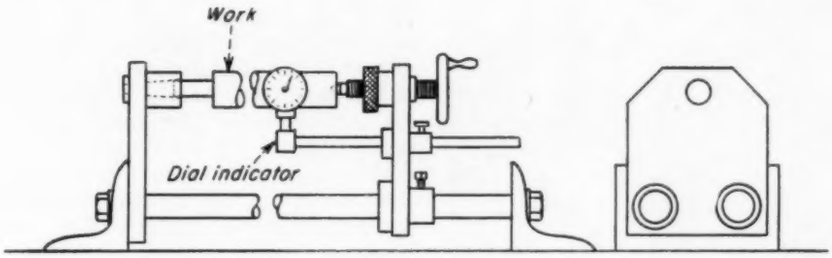
"I am not sure, Ed, that I get placed in just the right place on the scale on all the factors, but having a chance to talk it over and ask the Old Man for suggestions as to how I can strengthen my weak points I like."

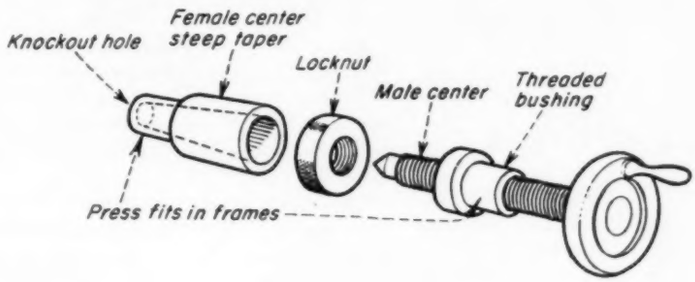
"I think it is all right for hourly employees, but rating supervisors is going too far."

"No, Ed, I like to feel that the fellows that get the better jobs have been rated and are not just someone's brother-in-law."

DO YOU LIKE MERIT RATING *when it rates you? How do other men you know feel about it? Your opinions and ideas will interest other readers. Discussions of earlier topics appear on later pages.*

Practical Ideas





Bench Centers Measure Shafts

Nearly every day hundreds of man-hr. are consumed throughout the country at straightening bent shafts. Most shops are equipped with powerful and efficient presses but few possess devices capable of answering the two most important questions in the straightening process: Where shall the straightening force be applied? How much correction is required?

A lathe makes an ideal testing fixture, but lathes are cutting machines and they are usually busy, or should be. Straightedges are helpful occasionally but they are no good for stepped shafts, armatures and so on. V-blocks fall down when the work has any keyways or splines.

For these reasons I have found the construction of this fixture time well spent. No heat has been used in making any joints except one pair of runner ends because heat warpage would spoil the flexibility and accuracy of the tester.

Ways, or runners, are made of 1½-in. cold rolled steel, 3-ft. long, drilled and tapped for a ½-in. capscrew at each end to provide for fastening to the angle-iron base pieces. After clamping the shafts together, they are draw-filed the entire length making a ½-in. flat seat for the locking setscrews.

The two ends are made of ¾-in. plate burned to shape and "tacked" together for trimming and machining to identical shape. Half-inch pilot holes are drilled in the plates before separation because the stationary and the moving plate will require different diameters ultimately.

The outside surface of a discarded 1 to 2 Morse taper sleeve adapter is step-turned and pressed into the center hole in the stationary plate, making a female center. A tapped bushing is pressed into the corresponding hole in the moving plate, and this is fitted with a ¾-in. cone-pointed screw and a knurled locknut. The screw should be made of tool steel, hardened and ground, and a handwheel will facilitate adjustment.

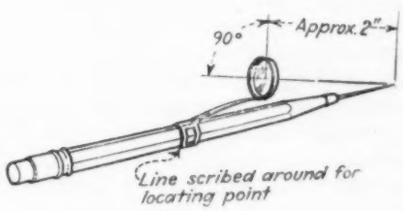
The runner sleeves are made of 2x6-in. mild steel turned to a press fit outside and bored to a running fit. Adjustment will be easier if helical grease grooves are cut after boring. Grease cups should be installed 90° away from the setscrews. *George F. Burnley, Oakland, California.*

Magnifying Scriber Aids Precise Layout Work

The nature of my work the last few years has required some very accurate drawing board layouts, usually magnified ten times, and accurate to 0.01 inch.

As it is very difficult to get an accurate layout without some mechanical aid, especially when it is necessary to wear eye glasses, I devised the following equipment, which works exceedingly well.

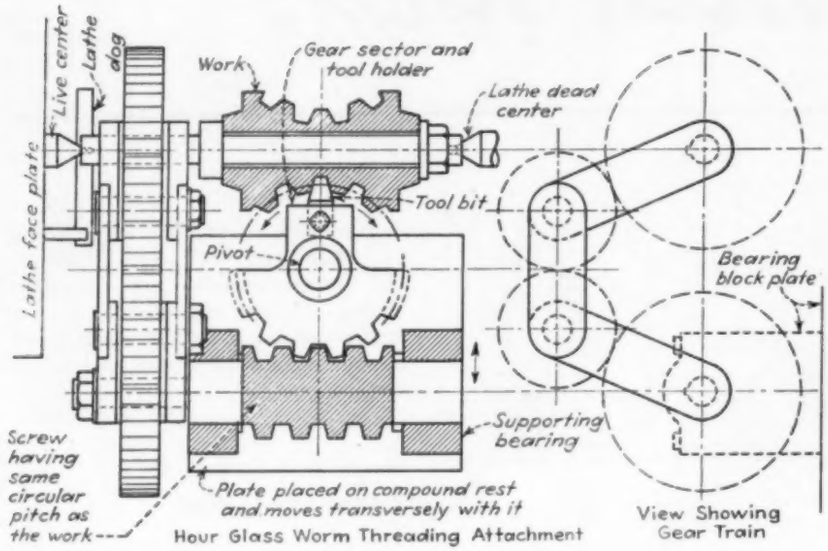
A 3-power magnifying glass of about ⅝-in. diameter and 2-in. focal length was mounted in a turned brass ring, and a pencil pocket clip was soldered to the brass lens ring.



A sewing needle was broken off just below the eye and put in a mechanical pencil in place of the lead. With the needle retracted, squeeze the tip of the pencil enough to reduce the opening a little. The needle should be quite tight when it is fed out.

The lens clip can be slipped up and down the pencil barrel to suit anybody's habits, and if desired, marks can be made to find the desired focus quickly.

This clip will also be found useful on plain drawing pencils when very accurate marks are required on a paper drawing as it is easily interchangeable. *A. F. Fuller, Schenectady, N. Y.*



Lathe Makes Hour-Glass Worms

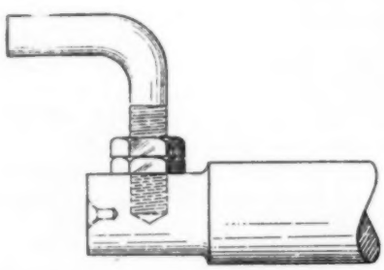
Two simple gear trains, one rigid and one flexible, provide the necessary means for cutting hour-glass worms of any pitch. This setup doesn't even require a screw-cutting lathe or any such attachments.

First, a plain screw of the same characteristics as the desired worm is selected, and a wormwheel of the designed meshing diameter is selected and modified into a toolholder carrying a toolbit ground to involute tooth form, like one of the gear teeth it replaces. This worm and wheel combination is mounted on heavy, carefully fitted bearings in a base which will clamp to the lathe carriage with the worm parallel to the spindle and the toolbit at spindle center height.

Next, a train of four spur gears is assembled with flat links as bearing housings, permitting a variable center to center distance between the input and the final output gear. Ratio must be one to one and rotations must be watched to be sure that the correct lead is obtained on the worm being produced. The input gear is keyed to the work mandrel, between centers in the lathe, and the output gear is keyed to the master or carriage screw.

The cut is taken starting at one end of the worm blank, the tool backed off, spindle reversed, tool reset, and another cut taken. Increased feeds will close the distance between the two end spur gears of course, but this has no effect on the relative angular position of the two screws.

It is not essential that the master worm and wheel be the same as the desired hour-glass worm. A universal fixture can be built along similar lines using any worm and wheel and carrying an adjustable toolholder. Driving gear trains of various ratios could be assembled rapidly to meet the pitch requirements of any particular job by driving the worm at such speed that the toolbit would travel in the desired arc at the desired speed. *Ching-Fu Chen, Chungking, China.*



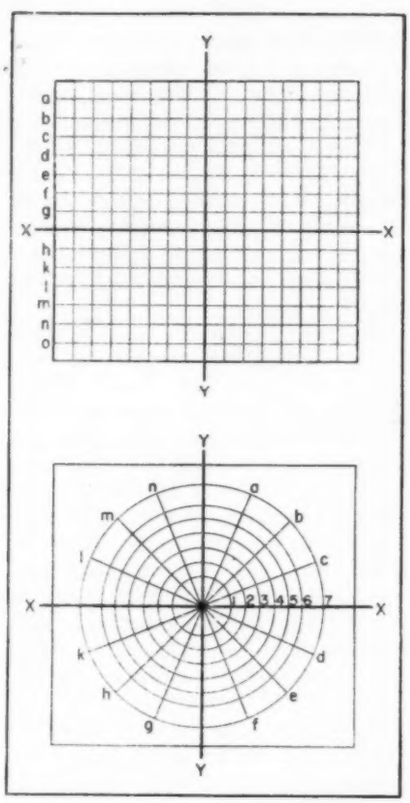
Permanent Dogs on lathe mandrels simplify the setup problem considerably. When a shop is busy, many of the standard dogs are likely to be in use and the needed one may be hard to find. This system eliminates that problem, and eliminates one step in every setup because the dog is already in place. *Robert S. Alexander, Greenville, R. I.*

Grids Improve Drawing Dies

Correct blank shape and size to form any but the simplest shells is difficult to determine, and when defects like wrinkles and tears develop, the exact cause may be hard to locate.

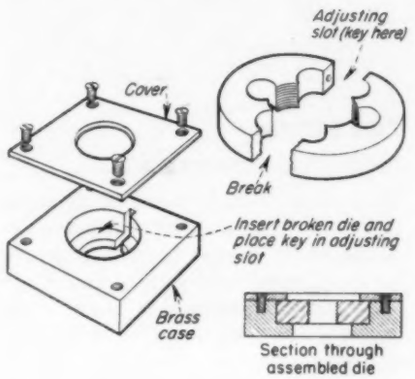
Depending on the nature of the part, a grid, according to either the polar or cartesian system of coordinates, can be indelibly scribed or etched into the surface of a piece of the same stock as will be used for the actual work. The exact effect of every draw (in a multiple operation) can then be evaluated by taking direct measurements. Amount or percentage of stretch will be easier to calculate if the distance between grid lines is made 0.1, 0.2 or 0.5 inches.

More or less symmetrical parts which are to be deep-drawn will probably make best use of the polar coordinate system when the radii will indicate the straightness of draw and the concentric circles will show the minimum required blank size and the amount and uniformity of the stretch. Large shallow parts, or those which are likely to stretch in several directions can use the rectangular or cartesian coordinates with the possible addition of a couple of 45° diagonals. In either case, the outline of the final draw (after

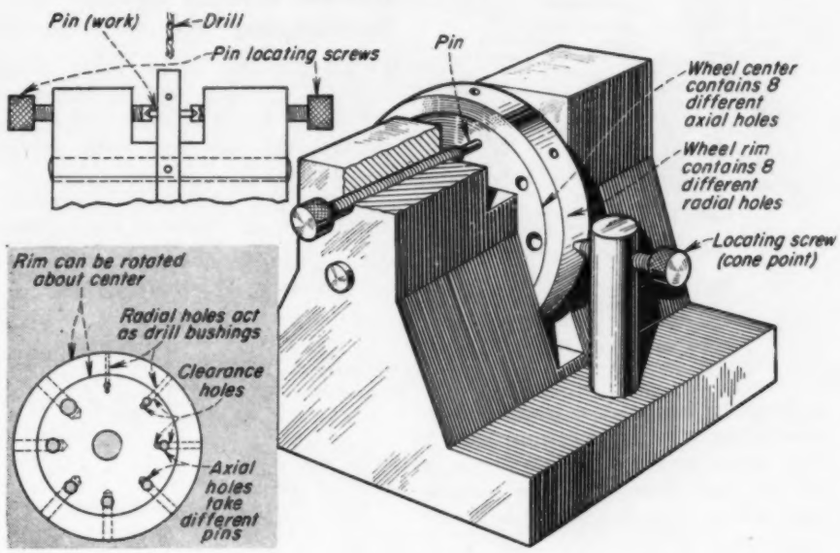


trimming) can be transferred to a flat templet, marked off in identical fashion, by counting the number of lines in both directions to every point on the part profile.

When troubles develop, the grid-blank will show their location, and changes and corrections in the dies can be made with more assurance and less cut-and-try. *Aleksander Wolosianski, Dr. Eng., Windsor, Ontario, Canada.*



Die Repair—Button dies which have split in half can be repaired by encasing the pieces in a brass block carefully bored in a lathe to a good press fit. A keyway was cut in the block and a steel key pressed into place in the adjusting slot in the die. The key serves as driver and adjuster both. A cover plate completes the repair. This trick saved the day for us when time was short and no other dies were obtainable. *Fordyce W. Brown, Springfield, Ill.*


Pin (work)
Drill
Pin locating screws
Pin
Wheel center contains 8 different axial holes
Wheel rim contains 8 different radial holes
Locating screw (cone point)
Rim can be rotated about center
Radial holes act as drill bushings
Clearance holes
Axial holes take different pins

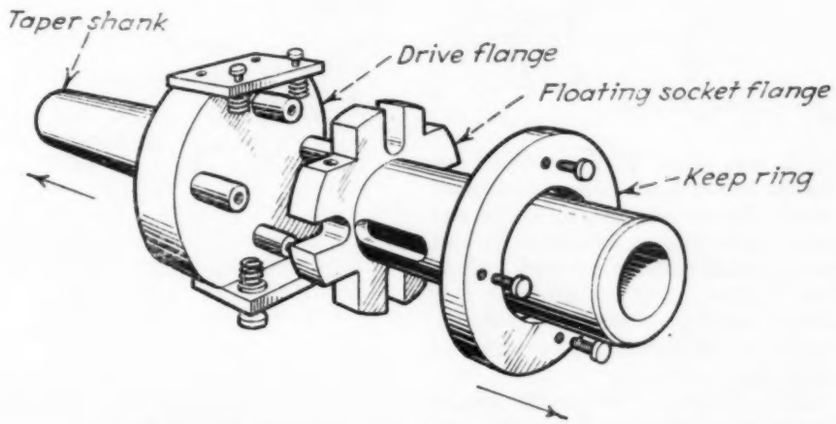
Wheel Jig Cross-Drills Pins

Locating and holding short pins requiring a transverse hole or holes is no cinch, usually. This jig makes quick work of the job. A central wheel is made in two parts. That is, the hub and disk are separate from the rim. The rim carries a whole row of drill bushings to handle as many pin-hole sizes as required. The only stipulation is that holes must be spaced so there will always be a clamping hole 90° away from the desired drilling hole.

The hub is longitudinally drilled as near its periphery as possible with as many different hole sizes as there will be pin sizes requiring drilling.

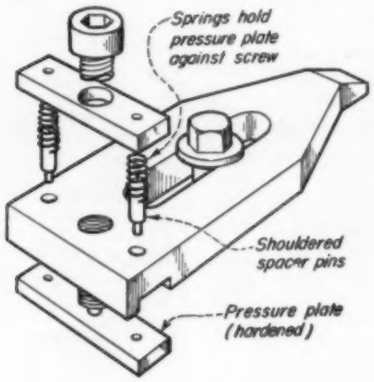
The jig is adjusted by placing any large pin in its corresponding axial hole and tightening it between the two female screw centers. Then a radial pin can be inserted to jack the rim around until the desired hole size comes opposite the desired pin size. Marks scribed on the face of hub and rim will help to locate the parts on center for any combination.

Now, pins to be drilled can be inserted between the screw centers, one by one, and located longitudinally by using one or the other of the screws as a stop, and the wheel rim is held firmly with the cone-pointed setscrew at one side. (The pin itself between the centers prevents any possibility of slip between rim and hub once the components are in place.) Long rods can be drilled by removing the center screws and positioning them with clamps. *H. Moore, Leeds, England.*

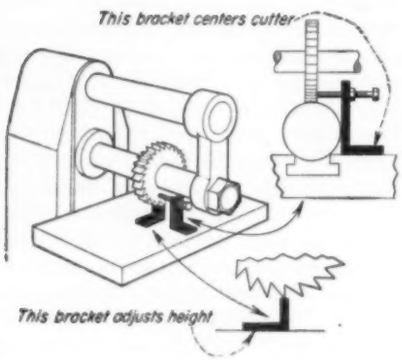


FLOATING REAMER HOLDER STAYS PARALLEL—Adjusting the four screws on the drive flange moves the socket flange into exact alignment with the rotating axis, but contact is with springs only so the socket remains floating. The keep ring and spacer studs allow only enough clearance for an easy sliding fit and the tools are firmly held in the taper shank parallel to the axis at all times. *G. A. Coleman, Surrey, England*

Adhesive Tape of the double-coated type has many shop uses. Non-marring lathe chuck jaws can be quickly installed or removed by placing a strip of the tape over each jaw and then imbedding flat strips of brass or soft steel. The adhesion is more than adequate as stress is mostly compressional. This tape is also convenient as a replacement for hold-downs on light duplicating and engraving work. *H. C. Rickenbach, Pittsburgh, Penna.*



Improved Clamp—A hardened pressure plate, two spacer pins, and a top plate and springs provide a smooth and firm clamping surface that will not mar work and is at the same time widely adjustable without the need for miscellaneous shims and pieces of scrap. The two springs hold the pressure plate upwards against the clamping screw at all times. *Edward O. Merical, Dayton,*



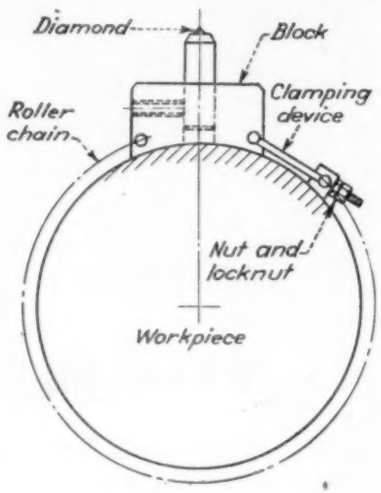
Standardized Keyways—We have a lot of key slotting to do on various work, and in the interests of uniformity and interchangeability, we have standardized on one specific keyway size for each shaft diameter. But because so many different men operate the machines, there was a need for still further standardization.

Two simple gages were then made for each shaft diameter and corresponding cutter width. One adjusts the table height for uniform keyway depth and the other measures from one edge of the shaft to the near edge of the cutter, establishing the center of the keyway. Careful use of these brackets has produced much more uniform work than possible heretofore. *William C. Blackham, Dorchester, Mass.*

Diamond Dressers Clamp To Workpiece

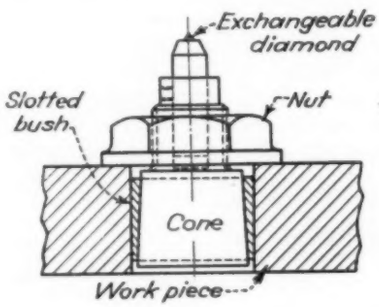
Finish-grinding large parts, when wheel redressing will be necessary before the job is finished, can be improved and hastened with devices like these.

A producer of large rolls provided an attachment carrying the diamond



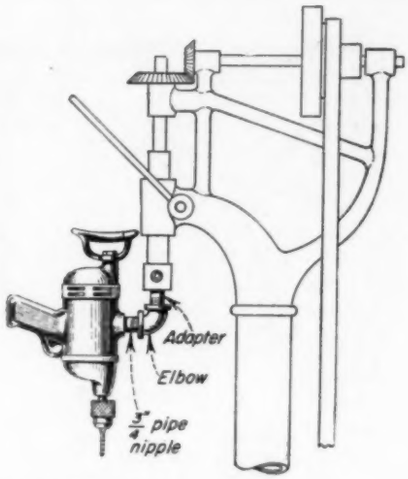
on the surface of the roll with a piece of roller chain. In this way the grinder required the minimum of movement to have its wheel surface dressed.

Flat surface grinding where the



work has holes in its surface can make use of a diamond dresser which fits in one of the holes and expands in place. Incidentally, this clamping device can be used to hold non-magnetic parts to grinding machines and to hold cemented carbides, or diamonds in boring bars with plain holes.

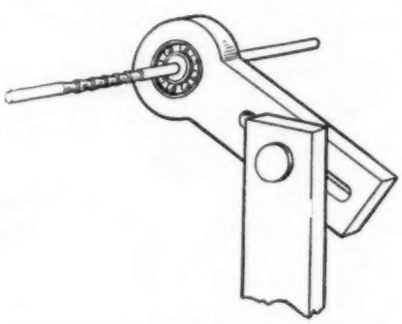
Both of these attachments can be installed and removed quickly, and in some cases, they can be left in place on some previously finished section of the work or on the work-holding device itself. Setscrews permit accurate adjustment. *Paul Grodzinski, London, England.*



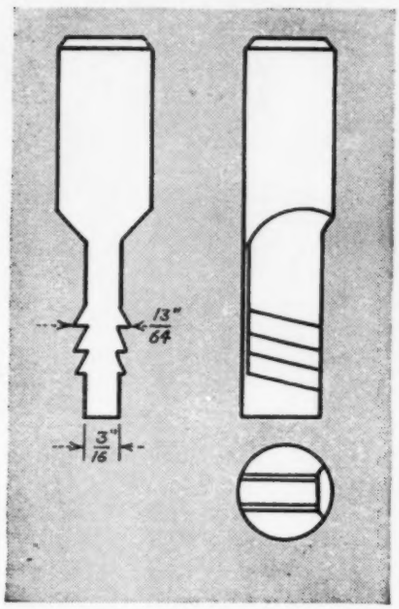
Pipe Fittings Make Drill Conversion

In general repair work it is often handy to have a small drillpress because of its higher speed, compared to the larger, heavy duty machines. This simple conversion may prove worthwhile even if the shop is well-equipped, because there are always rush periods when capacity is insufficient, and this kind of rig will bridge such a temporary gap.

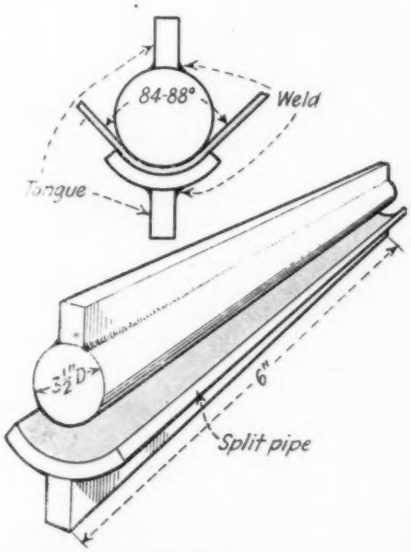
The standard pipe handle found on most portable electric drills is removed and in its place is substituted a close nipple, a 90° ell and a fitting to match the drillpress spindle. For good results, care should be taken to insure that the portable drill spindle is parallel with the big drill, and most of the thrust should be absorbed on the portable drill itself to lessen the possibility of bending the fittings. *N. S. Beebe, Kansas City, Mo.*



Steadyrest—Slender broaches have a way of springing during sharpening, and even with light grinds, some difficulty is encountered. This ball-bearing steadyrest, equipped with bushings to accommodate various work diameters snugly, has cut grinding time to one-tenth. *T. Yates, Coventry, England.*



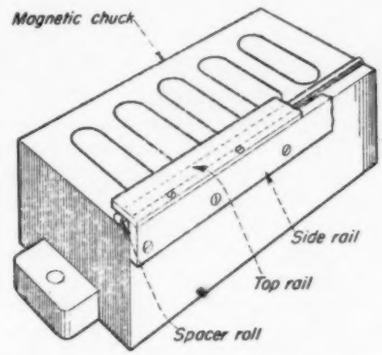
Broaching Slots—A lot of bronze cover plates were finished with six radial, milled slots 3/16 in. wide, to receive 3/16-in. bolts. But the bolts were plated which added just enough metal to cause binding and prevented insertion at all. We overcame the problem by making a small push broach to enlarge the slots to 13/64 in. This, operated in a small bench arbor press, proved fast and effective. *Donald A. Baker, Boonton, N. J.*



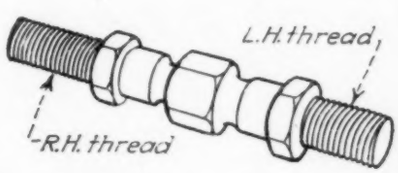
Welded Pipe Die Saves Hundreds of Dollars

A 1¾-in. radius was required on a certain 6-ft. long cabinet part. A set of dies for the job was quoted at several hundred dollars so we built our own. The punch was a piece of 3½-in. shafting and the die was made by cutting out a section from a piece of 3½-in. pipe whose actual I.D. was about 3⅜. This was planed with a tool ground to the desired radius (slightly over 1¾ in.) Both punch and die had a tongue welded on corresponding to the grooves in the press brake ram. *Raymond F. Ball, Utica, N. Y.*

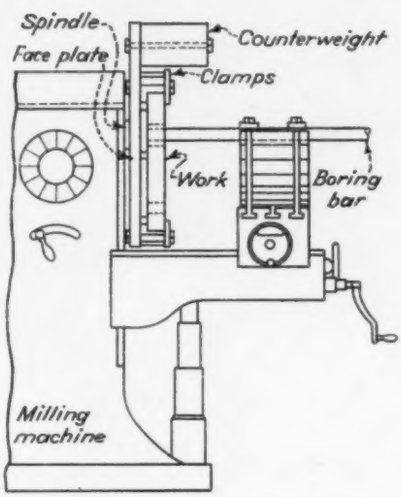
Forming dies of this type can be useful in bending hooks, straps or sheets with anything up to 90° bend.



Chuck Guide—A side rail added to a magnetic chuck is an investment in productivity that will reduce set-up time and insure greater accuracy. The side rail, made from ground stock, should be ground to a nominal dimension after fastening to the chuck. The protruding end of the top rail is ground square with the chuck after the spacer roll has been installed. *Edmund L. Johnson, Pittsburgh, Penna.*

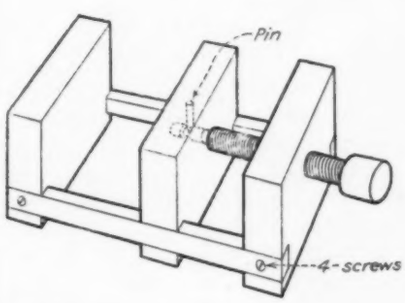


Tailstock Coupling—A piece of hex rod provided with a left-hand thread at one end and a right-hand thread of the same pitch and diameter as the other makes a convenient link which can be screwed into place between the lathe carriage and tailstock (holes must be carefully tapped in accurate alignment) for power feeding the tailstock, especially in cases where a simultaneous carriage and tailstock operation are practicable. Tailstock should be only tight enough on the ways to prevent chatter. *Lyle Vinger, Waukesha, Wisconsin.*

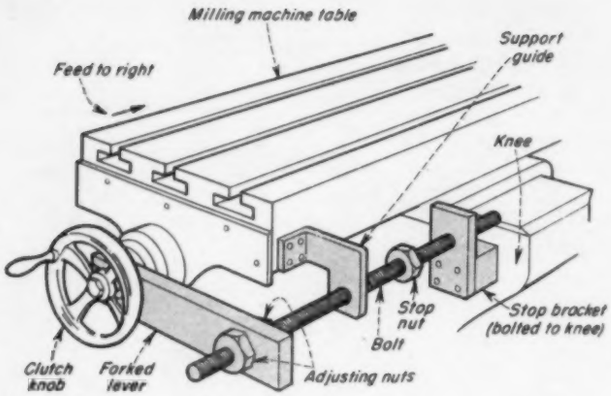


Milling Machines Swing Large Diameters

Small shops stymied by lack of lathe capacity when large-swing jobs come along can make use of variations of this milling machine setup. A large mild steel faceplate was mounted on the spindle permitting a wide variety of chuckings. In this case, some eccentric holes in a large plate had to be bored. The plate was arranged to rotate about its own center on the faceplate and a counterweight was provided to minimize spindle stresses. The boring bar was elevated on shims to center height and small adjustments were made with the knee. *R. M. Dunlevy, San Francisco, Calif.*



Simple Drill Vise—Three rectangular plates are milled to take two side rails and one of the plates is then given just a little more clearance for easy sliding. Screws hold the rails in place but alignment is taken care of in the closeness of the fit. A screw, pinned to the moving jaw, completes the vise. The vise should be square in any position and the side rails act as parallels for positioning work. *Arnold Dyck, Port Credit, Ontario, Canada.*



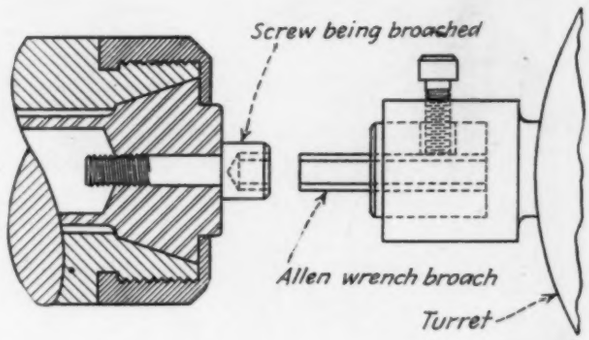


Table Stop Frees Miller Operator

Milling machines which lack a table feed stop require constant operator attention. When automatic stops are present, he is free to tend several machines thereby greatly increasing his productivity.

Here is a simple stop which can be made and installed in three hours at a cost of less than a dollar for materials which will work on any miller having a push-pull clutch feed knob.

A long threaded rod is mounted parallel with the machine table by means of suitable angle brackets bolted to the machine. There is another bracket on the knee through which the screw can pass freely. A forked member is fastened to one end of the rod with two hex nuts so it slips behind the longitudinal feed handwheel clutch knob. With the machine set for the beginning of a cut, stop nuts are moved along the screw until they are the desired distance away from the fixed knee bracket. When this adjustment is made, the machine will begin to feed when the clutch is engaged and stop only when the stop nuts prevent further travel of the screw whereupon the fork will disengage the clutch and stop the machine automatically. *John Meyer, Glen Rock, N. J.*

Hexagonal Broach—The easiest way to make socket heads for special screws is to use a sharpened Allen wrench as a broach. Screw blanks, collet-chucked, are first drilled, then broached with the proper sequence and setting of turret tools on a hand screw machine. *Dana J. Mulholland, Newport, R. I.*

Shaper Tests New Dies—Instead of walking all the way over to the production shop and then waiting for a press to try out new dies, toolmakers can mount the dies in a shaper and adjust it to the proper stroke for operating them, thus saving a great deal of time. *Arnold Dyck, Port Credit, Ontario, Canada.*

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Thirty-seventh Selection—J. C. Magee's Lathe Controls Spacing

175,000 JAM MACHINE TOOL SHOW

CHICAGO—The 1947 Machine Tool Show proved to be the biggest drawing card for buyers in the history of the industry. Never before has any event in peacetime struck the machine tool industry with such terrific impact. Total attendance exceeded 175,000, compared with 55,000 at the last show in 1935.

Held in the Dodge-Chicago plant Sept. 17-26 by the National Machine Tool Builders' Association, the show was a powerful magnet for users from all over the world. Attendance passed the 100,000 mark, the goal set by the show committee, on the fifth day.

The Ford Motor Co. sent 600 of its key men to view the 2,021 new machines exhibited in action by 294 U. S. companies. Allis-Chalmers Mfg. Co. dispatched 180 of its important production executives to the show. The show was thick with top-drawer buyers from all segments of metalworking, eager to see "The world's largest machine shop" with its $16 million of postwar-designed machine tool models. Some 220 types of machine tools were on display.

It was the first show in 12 years and only the fourth in the industry's history. Occupying 12 acres of exhibit space, it proved to be the largest industrial show ever staged in this country and probably in the world. Charles F. Kettering, retired General Motors vice-president, described it as America's "Arsenal of Abundance."

Cost cutting with new machine tools is the way to a sound economy said Herbert H. Pease, pres. NMTBA and pres. New Britain Machine Co.

The great exposition, referred to as "the measure of America's industrial might," was devoted to the primary purpose of cutting costs of metalworking production. Its slogan was "more goods for more people at lower cost."

Formal opening of the show, which was in operation daily except Sunday from 10 a.m. to 5:30 p.m., was preceded by a Preview Day program on Sept. 16. Approximately 5,800 invited guests inspected the exhibits. Climax of the day's activities was a dinner at the Stevens Hotel with Henning W. Prentis, Jr., president of Armstrong Cork Co., as chief speaker.

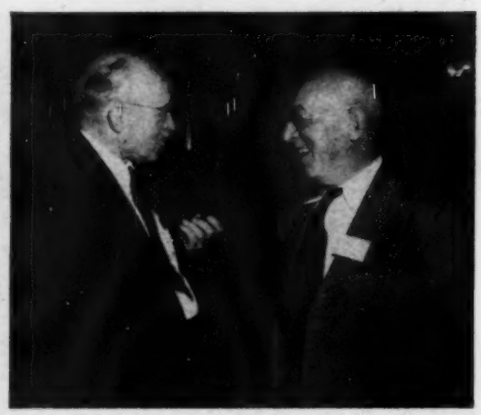
On Sept. 23 the Association sponsored a dinner for overseas visitors at the Palmer House. Brooks Emeny, president, Foreign Policy Association, was the speaker and Charles J. Stilwell, president, Warner & Swasey Co., toastmaster. The officers and directors of the Association held a private dinner on Sept. 25 for the directors of the British Machine Tool Trades Association.

Concurrent with the Machine Tool Show was the Machine Tool Congress, meetings of which were held at night. Details of the Show and Congress are on the following pages.

SPECIAL AMERICAN MACHINIST REPORT ON MACHINE TOOL SHOW

INVITED GUESTS attended Preview Day showing. Reception committee members worked in shifts. Here Eugen Abegg, pres. Ill. Natl. Bank & Trust, Charles Stewart, pres. A. C. Woods, and Irl Martin, pres. Woodward Governor are welcomed by J. H. Myers, v.p. Lodge & Shipley, E. K. Morgan, v.p. Giddings & Lewis, E. C. Bullard, pres. Bullard Co., and Fred Schoeffler, v.p. Lodge & Shipley

UNVEILED 2MI plain miller is demonstrated by F. V. Geier (white shirt), pres. Cincinnati Milling Machine Co., for S. E. Bergstrom, sls. mgr., and these Ford men: R. H. McCarroll, dir. chem. engrg.; H. C. Kellogg, dir. purchs. engrg.; W. F. Wagner, dir. prod. engrg., Lincoln-Mercury



SENATOR FLANDERS of Vermont and C. Baldenhofer, pres. Thompson Grinder Co. pause to discuss size of the Show as the Senator visits the Thompson booth

RAILROADERS in the Monarch booth are J. J. Davis, gen. fmn. and V. P. Schmidt, wks. eng., Altoona Works, Pennsylvania Railroad with Wendell E. Whipp, chm. of bd. Monarch Machine Tool Co.

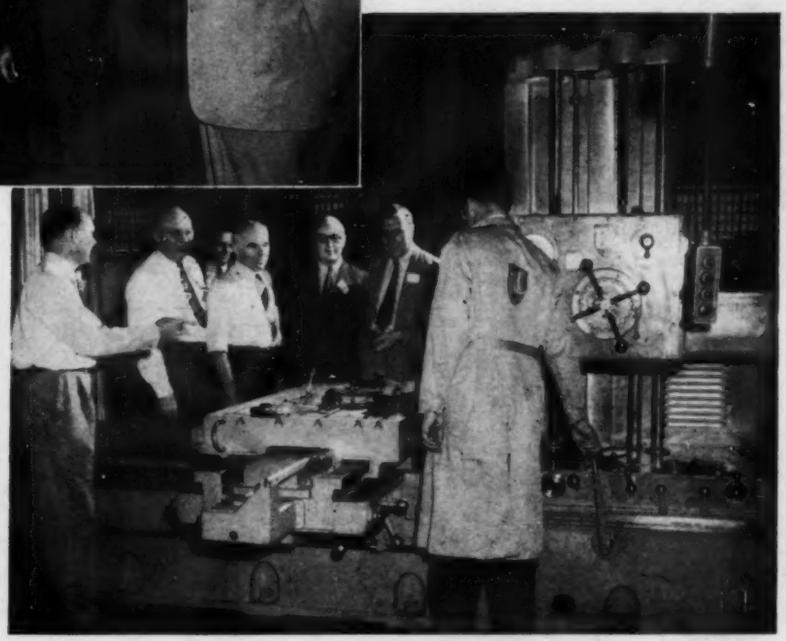
BEARING RACE ground on Van Norman oscillating grinder is examined by George W. Nordstrum, pres. Aetna Ball and Roller Bearing Co. Looking on are James Y. Scott, pres. and E. C. Adams, v.p. chg. sls., Van Norman Co.

THREAD grinding at Landis Machine Co.'s booth attracted General Motors men: Wilbur Hulse, asst. fact. mgr., Anderson, Ind.; M. E. Van Meter, ch. insp. and H. D. Dawson, asst. gen. mgr., Delco-Remy; F. W. Marschner, exec. asst. to g.m., New Departure, and C. A. Nichols, m.m. Delco-Remy

CHRYSLER MEN looking over the machines included John Hutchinson, asst. master mech. Dodge Div., C. E. Bleicher, pres. DeSoto Div., B. E. Hutchinson, chm. finance com. Chrysler, and Herman L. Weckler, v.p. and gen. mgr. Chrysler Corp.

HUSKY turret lathe at Gisholt Machine Co.'s exhibit was a stopping point for H. E. Muchnic, pres. Locomotive Finished Materials Co.; Walter Geist, pres. Allis-Chalmers Mfg. Co., and D. A. Wallace, pres., Chrysler Div., Chrysler Corporation, shown with G. H. Johnson, pres. of Gisholt

FORD visitors included D. S. Harder, v.p. and dir. of mfg., and John Dykstra, general production assistant, Ford Motor Co.



WORKING range of new Giddings & Lewis 300-T horizontal boring, drilling and milling machine was discussed by R. J. Kraut, pres. G&L, with E. K. Morgan, sls. v.p. G&L; R. Herklotz, Ford; and C. M. J. Willeumier, wks. mgr. and F. G. Stork, dir. Stork Bros., Netherlands

DANGERS OF SOCIALISM STRESSED BY PRENTIS AT PREVIEW DINNER

Free competitive business has never failed, H. W. Prentis, Jr., asserted at the Preview Dinner of the National Machine Tool Builders' Association. He pointed out the destruction of politcial intellectual and spiritual freedom in Russia, Italy, Germany under planned economy

CHICAGO—The termites of state socialism have already eaten far deeper into the American body politic than most of us realize, H. W. Prentis, Jr., president of Armstrong Cork Co. and former president of the National Association of Manufacturers, warned at the Preview Dinner of the National Machine Tool Builders Association. Invited guests at the dinner were key machine-tool buyers attending the show.

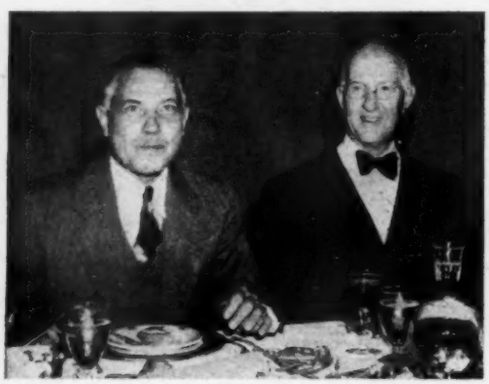
Mr. Prentis noted the five general categories of machine tools and cited counterparts to these classifications in the tools of a free society: Political, intellectual, personal, economic and spiritual.

"Our unique political institutions here in America are the fruit of the work of the grinding machines of age-long social experience in the field of popular self-government. The breadth and depth of our intellectual life hinge directly on the shapers of our educational system. Our personal effectiveness as free citizens is fixed by the character-cutting milling machines of self-reliance, initiative, thrift, tolerance, civic virtue, social cohesiveness and courage. Our economic welfare depends on how efficiently the lathes of our free enterprise organization are kept turning. And finally in the spiritual realm, our national destiny will be determined by the degree to which the drill presses of the Almighty penetrate the inner recesses of our souls and permeate us with an all-pervading sense of personal responsibility and a renewed realization of the dignity of the individual—the principles on which our freedom rests and without it cannot long endure."

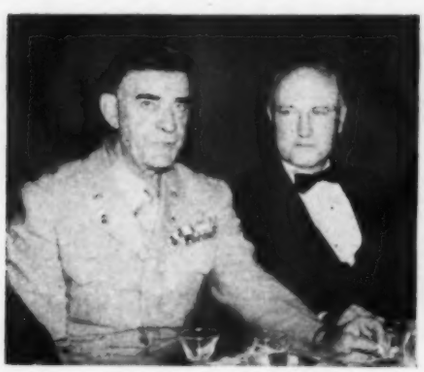
America is today "almost the last remaining bulwark of freedom on the globe," he said, and urged that the "tools of our free institutions" be reexamined, refurbished, sharpened and used "for freedom is not a gift. . . . it must be shaped and turned and ground out" with the tools we have by each generation.

(VIEWS OF SPEAKERS' TABLE)

G. H. Johnson, pres., Gisholt (1); H. L. Tigges, exec. v.p. Baker Bros.; E. B. Gleason, pres. Gleason Works



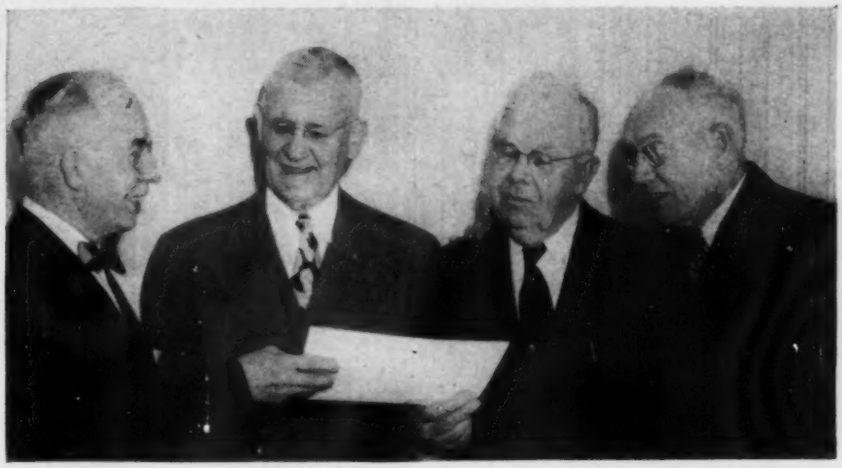
W. L. Dolle, pres. Lodge & Shipley (left) and A. M. Johnson, pres. Barnes Drill



Maj. Gen. E. S. Hughes, Ordnance Chief; L. D. McDonald, v.p. Warner & Swasey Company

(L. to r.) Mrs. Frida Selbert, NMTBA secy.; H. W. Bockhoff, pres. National Automatic Tool; D. M. Pattison, v.p. Warner & Swasey; R. J. Kraut, pres. Giddings & Lewis; A. G. Bryant, Cleereman v.p.

COMMENTATOR LEWIS warned his audience that majority rule is endangered by the inroads of small, organized minority groups



HONORARY MEMBERSHIP certificates were presented by A. B. Einig (left), past pres. of the Assn. and pres. Motch & Merryweather to J. W. Wright, William F. McCarthy, and J. Roy Porter. Also receiving a certificate was John Sauer, Jr. who was unable to attend the dinner

1947 MACHINE TOOL CONGRESS OPENS WITH DISTRIBUTORS' ASSN. DINNER

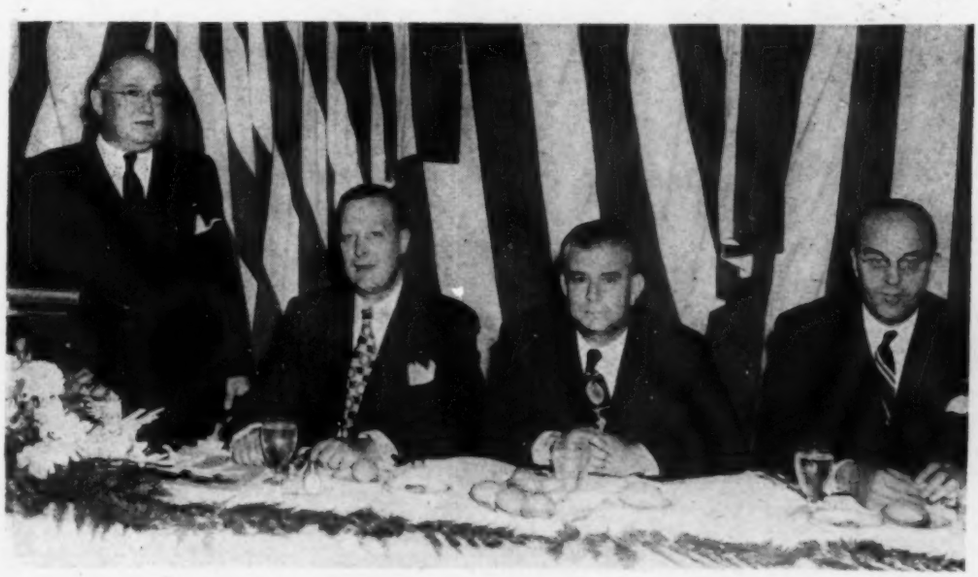
CHICAGO—Opening the 1947 Machine Tool Congress, the dinner meeting of the American Machine Tool Distributors Association presented as the principal speaker Fulton Lewis, Jr., radio news commentator, who spoke of "Democracy With A Gun in Her Ribs."

President George Habicht, Jr. of the Assn. and pres. Marshall & Huschart Machinery Co. presided at the dinner held in the LaSalle Hotel. K. H. Hobbie, pres. of the 1947 Congress and v.p. Driver-Harris Co. opened the series of meetings by calling attention to the fact that American eminence is due both to individual and collective efforts. In addition to the initiative of personal freedom and enterprise, the cooperative exchange of new ideas through technical societies and business associations have contributed immensely to our industrial progress, he told his audience.

Herbert H. Pease, pres. of NMTBA and the New Britain Machine Co., said that it was not a coincidence that the American Revolution and the industrial revolution came about the same time. It was not until machine tools pointed the way toward greater productivity, he said, that political devices likewise implemented the path to greater individual freedom.

In the main speech, Fulton Lewis, Jr. decried the trend in America away from majority rule through the yielding of government to minority groups which were able to bring undue pressure. He told his audience that if American institutions were to be preserved, each individual must take an active interest in his government on the local level.

In explaining that he was neither a Republican nor a Democrat, Mr. Lewis said that after a number of years as a Washington observer his general attitude toward politics every election was to "throw the rascals out." Following his prepared speech, he answered questions from the floor with marked frankness, holding his audience for some time after his speech was finished.



TOASTMASTER George Habicht, Jr., pres. Marshall & Huschart Mach. Co. is flanked by Kenneth Hobbie, v.p. Driver-Harris Co. and pres. Machine Tool Congress, D. N. Macconel, newly elected pres. AMTDA and pres. Mach. Sales, and R. L. Giebel, 1st v.p. AMTDA and pres. Giebel, Inc.

TECHNICAL SESSIONS SPOTLIGHT MACHINE TOOL CONGRESS EVENTS

CHICAGO — Lack of fundamentals or "know how" on the part of the designer can either make or break a change from cast iron to welded steel, James F. Lincoln, president of the Lincoln Electric Co., told the Production Engineering and Machine Design Divisions of the American Society of Mechanical Engineers Sept. 18.

Such things as the correct amount of steel to replace the cast iron, whether to bend or weld, the right amount of weld metal are all stumbling blocks for the designer who is new at welding, he said.

This was one of several sessions of the Machine Tool Congress which ran concurrently with the Machine Tool Show.

Form Grinding was discussed at this meeting by J. I. Wilson, Thompson Grinder Co.

Discussing "Turning" points in the Metalworking Industry, Myron S. Curtis, assistant director of engineering, Warner & Swasey Co., warned that production is not based solely on machine speeds. He told the American Society of Tool Engineers and the American Foundrymen's Association that his company had found that increasing the depth of the cut and feed in many cases more than offset decreasing these two for the sake of high spindle speeds. He urged more attention be paid to handling of materials to increase production and cut costs.

At this session of the Machine Tool Congress, T. E. Eagan, chief metallurgist, Cooper-Bessemer Co., presented a paper on When and How to Use Cast Iron. He urged stress relief annealing in place of setting the iron casting in the yard for six months, reporting that this latter method does not relieve the stresses.

Careful study of sections by the designer, Mr. Eagan claimed, is a necessity, and he pointed out that the higher the class of iron the more difficult it was to pour thin sections.

At the National Electrical Manufacturers Association meeting, Charles F. Kettering, research consultant, General Motors Corp. was principal speaker.

The Chicago Technical Societies Council, Electric Association, met Sept. 23. Kenneth H. Hobbie, vice president, Driver-Harris Co., and president of the Machine Tool Congress, greeted the guests. Machine Tools and the Philosophy of Production was presented by George Habicht, Jr., president of Marshall & Huschart Machinery Co. The minute a new machine is sold, Mr. Habicht said, "we have got to start figuring out how we can make another new machine that will be still better than the one we just sold. Otherwise, how will we get any business tomorrow?" He likened it to a golf course where par is cut down a few points ever year. Our philosophy will survive, he said, by giving people more than does any other; by producing more, in other words.

Experience has shown that a planned carbide milling program under one or more specialists is necessary for successful results in a plant, Michael Field, research engineer, Cincinnati Milling Machine Co., told the ASME session Sept. 24. This meeting covered the Production

BRITISH MACHINE TOOL TRADES ASSOCIATION secretary, William J. Morgan, London (left), is shown talking with John E. Lovely, v.p. Jones & Lamson, and Tell Berna, general manager of the NMTBA, at the Machine Tool Show

ATTENDING THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS' meeting at the Machine Tool Congress Sept. 18 were (left to right): J. C. Wilson, sales mgr. Thompson Grinder Co., J. F. Lincoln, pres. Lincoln Electric Co., E. D. Vancil, mgr. of engineering, Cincinnati Milling Machine Co., R. W. Mallick, asst. to director, Headquarters Manufacturing Dept., Westinghouse Electric Corp.

Engineering Division, and Special Research Committee on Metal Cutting Data and Bibliography.

Complete and accurate records of the milling and grinding conditions are desirable to build up experience and to control the carbide milling practice, Mr. Field asserted. The factors which affect tool life in carbide milling included cutting speed, feed per tooth, cutter angles and relative position of the cutter to the work.

Factors which affect the cost of milling with carbides, Mr. Field reported, indicated somewhat lower cutting speeds for the milling of steel than have been previously recommended. The transfer from high speed steel to carbides should be determined chiefly by economic considerations, he claimed.

An illustrated talk covering deep hole drilling, boring with solid carbide boring bar and milling a crankshaft was given by J. R. Longwell and Fred W. Lucht, Carboloy Co.

C. E. Frudden, SAE president and consulting engineer, Allis-Chalmers Mfg. Co., addressed the Society of Automotive Engineers at a Sept. 25 event of the Congress.

"A Trip Through the Machine Tool Show" was the subject of Joseph Geschelin's talk at the meeting.

The participating societies in this Congress were:

American Machine Tool Distributors' Association, American Society of Mechanical Engineers, American Society of Tool Engineers, American Foundrymen's Association, National Electrical Manufacturers Association, Chicago Technical Societies, Society of Automotive Engineers and the National Machine Tool Builders' Association.

METALWORKING MEN FROM ALL PARTS OF WORLD ATTEND OVERSEAS DINNER

NO ESCAPE is possible, said Brooks Emeny, from the alternatives of peace or destruction by atomic war

CHICAGO — Nearly 1,000 metalworking executives from all corners of the earth—Britain, China, Europe, India, Russia, Hawaii, Latin America and Dutch East Indies as well as the United States — attended the Overseas Dinner staged by the National Machine Tool Builders' Association on Sept. 23 at the Palmer House. The dinner was in honor of foreign visitors. Every industrial nation in the world was represented.

While we possess the machine tools for the material bases of whatever the future may hold, "we have now to acquire the most precious tools of all—an understanding of the responsibilities involved in this, the atomic age," concluded Brooks Emeny, president Foreign Policy Association, who made the principal address. His topic was "The Tools of Reconstruction.

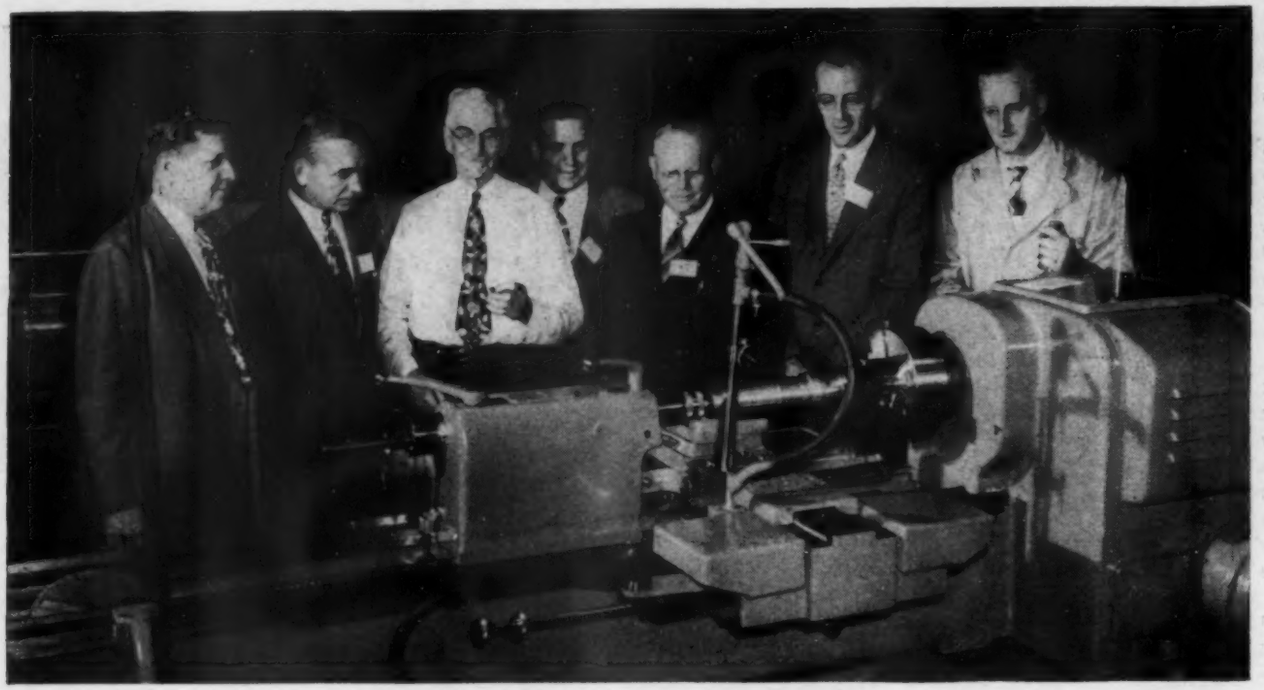
Dr. Emeny stressed that "the world can no longer afford the postponement of reconstruction and the alleviation of human suffering through Russian opposition alone." He pointed out that one of the reasons for American prosperity and strength lies in the freedom of movement of our people, our goods and our money. From the Marshall Plan should emerge not only the beginnings of reconstruction, but also cooperation of the interested nations in the advancement of this freedom.

"There is no escape," insisted Dr. Emeny, "from the world's greatest dilemma, that the only alternative to a viable peace is utter destruction through atomic war."

The formula of "more goods for more people at lower cost," said Herbert H. Pease, president National Machine Tool Builders' Association and president New Britain Machine Co., is just as good for the rest of the world as for America. If machine tool builders here can aid in spreading the gospel of greater productivity round the world, "we feel that we will have made some small contribution to a higher standard of living for all."

J. B. S. Gabriel of Charles Churchill & Co., Ltd., head of British group, with S. E. Bergstrom, chairman show committee and sls. mgr. Cincinnati Milling Machine Co.

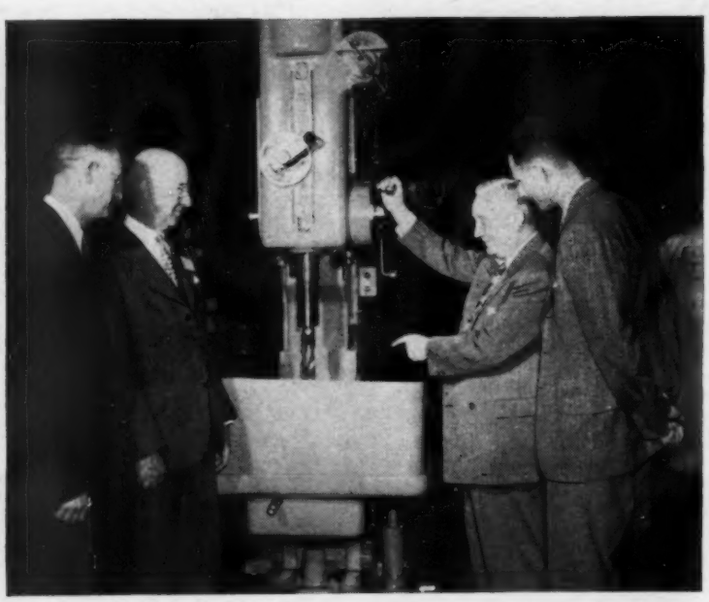
President Pease of NMTBA chats with Charles J. Stilwell, pres. Warner & Swasey Co., and toastmaster of the Overseas Dinner, shortly before the dinner began



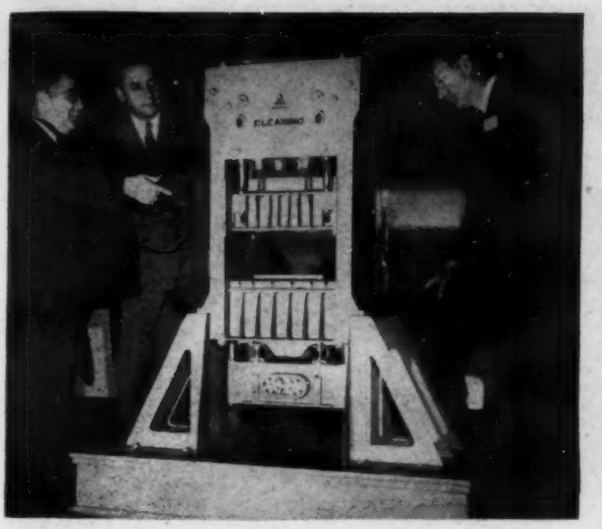
VETERAN MACHINE TOOL BUILDER R. K. Le Blond, (white shirt) chairman, R. K. Le Blond Machine Tool Co., proudly displays Le Blond's 16-in. Model RT toolroom lathe to Walter L. Smith, ch. prod. engr. Butler Mfg. Co.; Dan Ringis, asst. genl. master mech. Dodge Div., Chrysler; M. M. Engelbrecht, genl. toolroom fore., Dodge; and V. C. Norquist, v.p. Butler Mfg. Co., while R. E. Le Blond, pres. of Le Blond looks on

MEN AND MACHINES AT THE SHOW

HORIZONTAL SURFACE GRINDER No. 3B drew G. V. Hultgren, mfg. eng. Farrel-Birmingham Co. to the Abrasive Machine Tool booth where W. P. R. Sceeles, sls. mgr. and C. G. MacLeod, v. p. of Abrasive describe the machine's features



DIAL SELECTION of speed, feed, and depth is provided in new No. 221¾ Barnesdril. William Hegarty, wks. mgr. McKiernan-Terry; A. M. Johnson, pres. and William Fairbairn, v.p. and wks. mgr. Barnes Drill Co.; and Albert M. Keller, asst. wks. mgr. Buhler Bros. Switzerland look the machine over



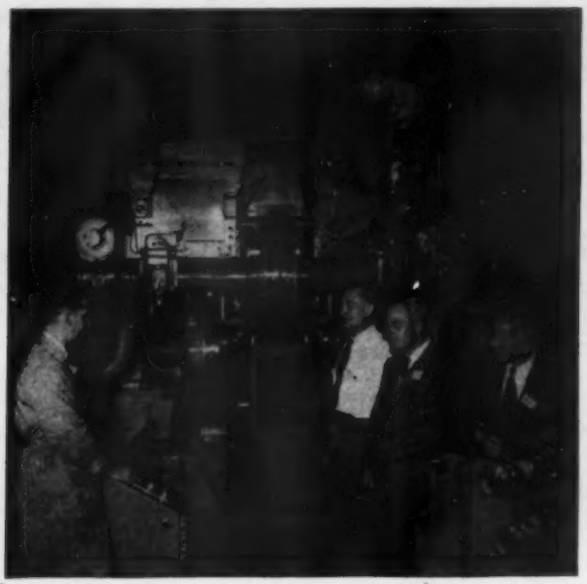
TO ENABLE Show visitors to visualize operation of its 61-ft. high triple-action press for auto roofs, Clearing Machine Corp. had a 1/15 scale working model. Present were W. F. B. Henderson, v.p.; K. Johansen, ch. engr., and H. P. Isham, dir.

FIXED RELATION between two basic slides on 3-B Jigmil is explained by C. B. DeVlieg, pres. DeVlieg Machine Co. to Fred Bates, tool proj. eng. Consolidated-Vultee Aircraft Co. Automatic positioning is provided which can be used to space relation between bored holes

DUPLEX ROTARY grinder Hanchett No. 24 is equipped with two worktables. R. V. Hanchett, pres. Hanchett Mfg. Co. is with R. L. Pottinger, v.p. Arnold Eng. Co.; F. C. Schaub, ch. eng., and J. F. Manting, for. sls. mgr. Hanchett

CROWDS SWARMED about the massive Fellows 10-spindle rotary gear shaper, which will go to an auto plant. C. M. Peter, gen. sls. mgr., Fellows Gear Shaper Co.; points to a machine feature, while the others are: D. Wilhelm, gen. fore. Stewart Warner; J. Giersch, gen. supt., Industrial Brownhoist; R. M. Fellows, v.p. & treas. Fellows Gear Shaper Co., and C. F. Albrecht, toolroom mgr. Industrial Brownhoist

SURFACE BROACHING (left) of castings and forgings on a high-production basis will be featured in future tooling-up programs. T. H. Doan, pres., Foote-Burt Co., talked over such problems with J. G. Hammond, asst. gen. mfg. manager, Buick Div., General Motors, then watched a horizontal chain-type Footburt machine



TURN MILLING of crankshafts is watched by E. Tempelmeier, staff supvr., Equip. Engrg. Dept., Westinghouse; and F. L. Chapman, v.p. and L. E. Godfriaux, engineer, Gisholt Machine Co., designer of this new type of machine tool developed by Gisholt

CLOSE TOLERANCES are held on the Brown & Sharpe automatic pinion turning machine. Shown are: R. M. Severance, pres. Severance Tool Co., with these B&S men: W. E. Anderson, show mgr.; B. P. Graves, dir. of design; A. H. Bainton, genl. consultant, and H. L. Merrill, sls. dir.

THREE SPINDLES of Bullard 30H Man-Au-Trol horizontal lathe turn rear-axle pinions. Present: L. Pawloski, m.m. Detroit Diesel Div., General Motors, with E. P. Bullard III, v.p. in charge mfg., and W. Thompson, Detroit sls. engr. Bullard Co.

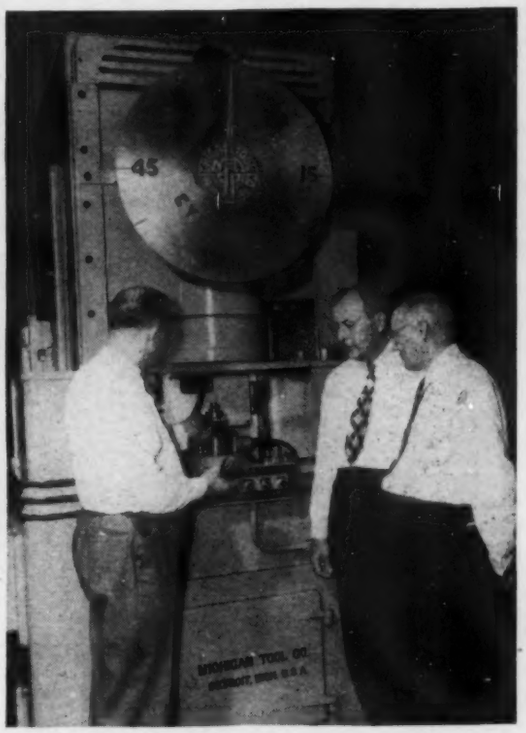
RIDE AROUND SHOW before opening was taken by George Gorton, Sr. (rt.) pres. Gorton Machine Co. in a gas cart driven by John Rachford, gen. maint. supt. Tucker Corp. with Ira R. Ogilvie, adv. mgr. Gorton

FASTER, cheaper metal cutting is claimed for 25 in. Pacemaker lathe. R. S. Alter, exec. v.p. American Tool Works Co., demonstrates to C. H. Cormany, sales; F. F. Loock, pres. Allen-Bradley; W. P. Coomey, supt. Rice-Barton Corp.; J. B. Doan, ch. and J. C. Hussey, v.p. American Tool Works; Howard L. Rich, pres., Lynd-Farquhar, and P. Barton of Rice-Barton Corp.

STEERING KNUCKLES are threaded on this Sheffield No. 105-15 thread and form grinder. Louis Polk (ctr.), pres. Sheffield Corp. explains it to W. H. Hartley, fact. mgr. and David Meekert, pres. Hobart Mfg. Co.

FINISH CUTTING a straight bevel gear from solid in one cut, a Gleason No. 2 generator is watched by E. B. Gleason, pres., H. F. Carver, sls. mgr. and D. VandeVate, wks. mgr. Gleason Works

BALANCE DRILLING UNIT which is pre-set for depth by sel-syns is used in Dynetric balancing machines. Stanley Dowd, sls. mgr. Leland-Gifford Co. describes it to H. E. Olson, chief tool eng. and F. J. Malone, plg. mgr. Hercules Motor Corp. as E. A. Heidlinger, Detroit mgr. Leland-Gifford looks on

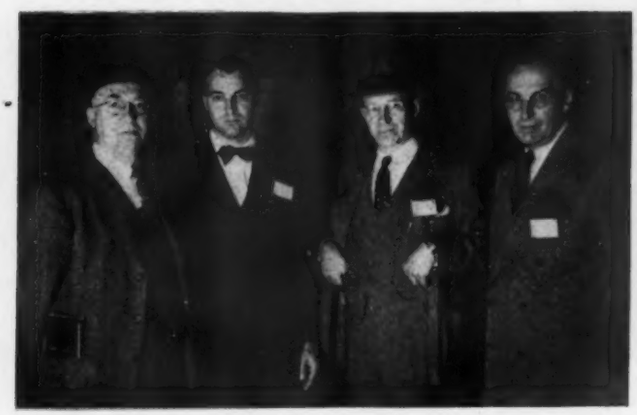


ALL GEAR TEETH are cut at once on Shear-Speed machine by blades placed radially in holder. P. F. Zerkle, sls. mgr., Michigan Tool Co., removes gear for O. L. Bard, Michigan pres. and H. A. Hallgrem, tool stores supvr. Tarmall Wks., International Harvester

SMALL TURRET LATHE drawing a crowd is the 3U Speed-Flex of Potter and Johnston. J. Earle Makant, v.p., plant oper., for P. & J. is at left. Weighing only 5000 lb., the 3U takes work up to 6-in. dia., is made in standard and high-speed models for automatic operation

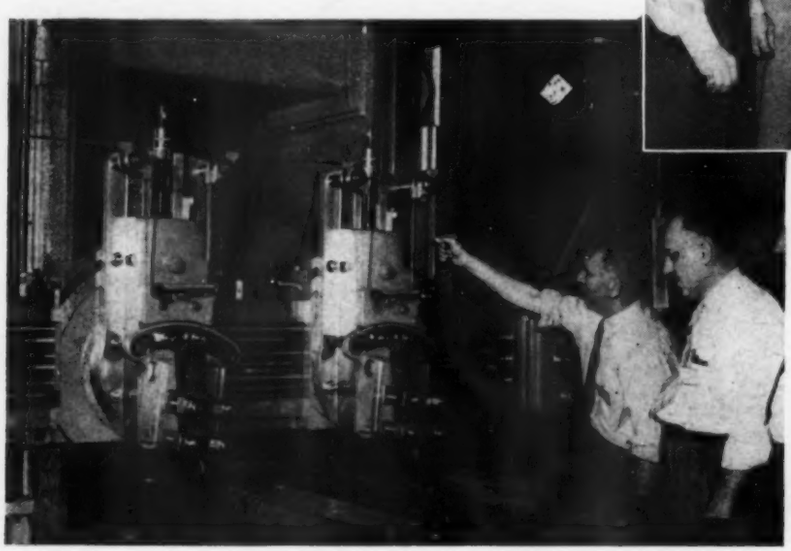
SMALL STAMPINGS are produced on No. 11 Multi-Slide Cecil Todd, pres. U. S. Tool Co., describes operation to A1 Post., supt. American Hardware, and R. W. Schmook of J. I. Case Co.

SELF-CONTAINED Barnes hydraulic sliding head No. SH-12 is a base for special machines. L. E. Conde, sls. mgr. W. F. & John Barnes, discusses it with D. W. Hamilton, equip. eng., R. Graham, mfg. eng., C. E. Brickner, equip. eng., Westinghouse



PAUSING AFTER THEY REGISTER are F. Koehn, eng., L. W. Falk, exec. eng., H. S. Falk, pres., W. P. Schmitter, ch. eng, all from Falk Corp. of Milwaukee

NEW TYPE of sensitive radial drill in the United States, this 4 ft. Fosdick machine is viewed by Paul R. Lempko, engr. Kidder Press Co.; O. Carlson, supt. of Dept. 4, Crane Co., Chicago, and C. E. Linden, g.m. Fosdick Machine Tool Co.

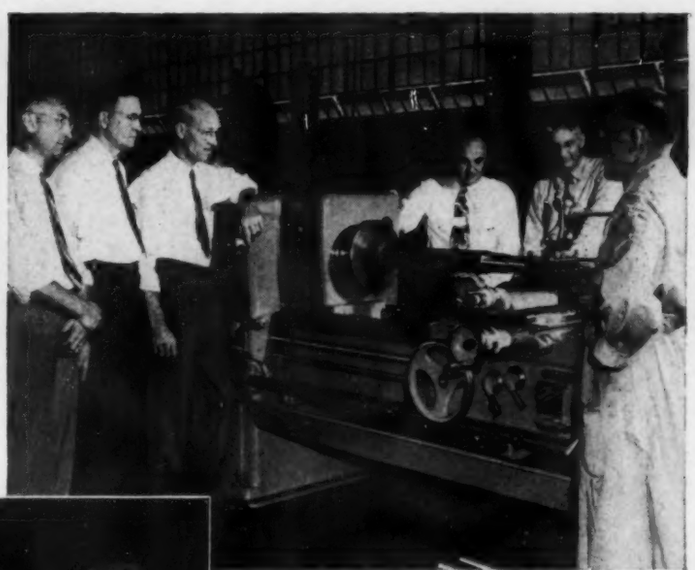


GIB LOCK of 42×42×12-in. variable-voltage planer is operated by August Marx. v.p. and gen. mgr. G. A. Gray Co., for P. A. Bolander, prod. mgr., Birdsboro Steel Foundry & Machine Co.

REDUCTION DRIVING GEARS produced on the Pratt & Whitney 26-in. universal gear grinder accurate to 0.0004 in. are examined by Clayton Burt, chm. of bd., W. P. Kirk, v.p., F. U. Conard, pres., of Pratt & Whitney

OPERATOR WORKS on metal in the same way a draftsman works on a blueprint on K & T 5D rotary head milling machine. J. L. Trecker, president, R. W. Burk, v.p. sls. Kearney & Trecker, W. G. Fotsch, pres. Jackson Fotsch, Walter Macomb, supt. Flexible Steel Lacing, H. B. Beach, Shakeproof Div., Ill. Tool, M. B. Beach, v.p. Flexible Steel

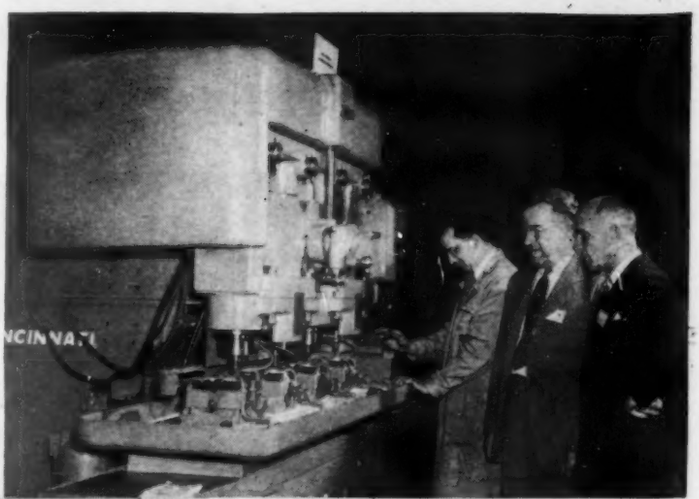
OUT COME THE DRAWINGS in the Hardinge booth as A. R. C. Ponge, engr., and M. J. P. Weitc, dir. Societe Anonyme, Alfred Herbert, Paris, confer with D. R. Laux, v.p. Hardinge Bros.



HIGHER SPINDLE speeds for carbide are featured in Sidney 20-in. lathe. People are: R. L. Anderson, methods & stds. sect. Minneapolis-Moline Power Implement Co.; C. H. Michelsen, plt. engr., Willys-Overland; F. D. Dickas, secy. & ch. engr. and F. J. Fields, v.p. & g.m. of Sidney Machine Tool Co.; E. L. Peltier, pres. State Machy. Co., and T. J. Logan, gen. supt. of Sidney

SINGLE-SPINDLE Warner & Swasey chucking automatic (left) for medium-lot production takes 6x6 in. pieces, has 5 tool stations. Right to left, watching, are: D. M. Pattison, v.p. Warner & Swasey; M. J. Lesko, plt. mgr. Republic Aircraft Products Div., Avco; J. F. Slavik, W. & S. sls. engr. Detroit, and J. W. Carthew, asst. wks. mgr. Westinghouse Air Brake

AUTOMATIC INTERNAL GRINDER with a 90,000 rpm. spindle is center of discussion by W. M. Smith, gen. sls. mgr., A. E. Stubbs, for. sls. mgr., Bryant Chucking Grinder Co. with David C. Ashbaugh and Glenn Stutsman, tool engrs. Easy Washing Machine Corp. This Bryant machine, No. 109 has electronic cycle controls



PLANE TALK alongside the 48x48 in. x 16 ft. Cincinnati Hypro planer (upper right) includes P. G. Dunmire, asst. facty. mgr., H. P. Holt, facty. supt., Fairbanks, Morse Co., St. Johnsbury, Vt.; and G. J. LaMoth, wks. mgr. and George Langen, pres. Cincinnati Planer Co.

TOOLROOM SURFACE GRINDER No. 55C made by Gallmeyer & Livingston has hydraulic feed. Group includes Charles Greene, day supt. and L. A. Boehme, night supt. Ohio Knife Co.; B. C. Saunders, sec. and sls. mgr. and Robert Saunders, Gallmeyer & Livingston; and D. N. Macconel, pres. Machinery Sales, Los Angeles

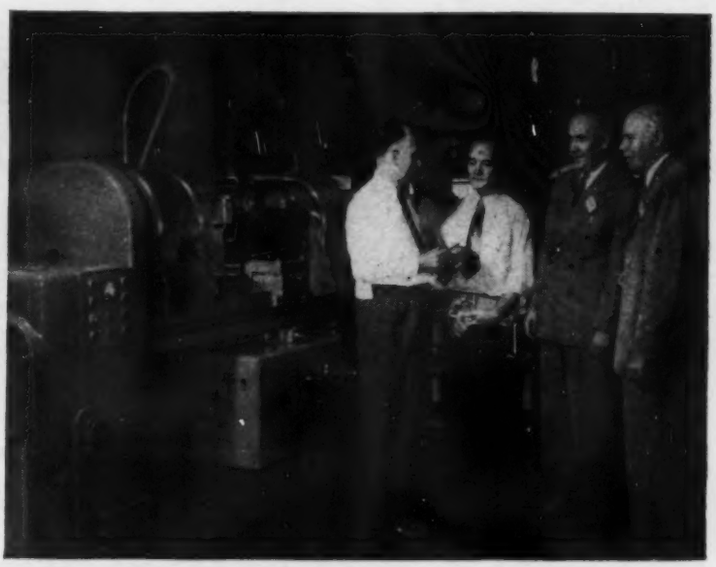
AUTOMATIC PROFILING on a Cincinnati machine captured the attention of two Ford officials: J. Lowry, asst. supt. Rouge plant, and W. F. Ploch, dir. mechanical design

GAGING METHODS are discussed by Paul W. Polk, mgr. Threadwell Tap and Die Div., Sheffield Corp. and J. F. Woodman, mech. supt. General Electric Co., West Lynn, Mass.

FINE-PITCH gear generator combines hobbing and shaping principles. Anthony Zamis, ch. des. engr. Illinois Tool, discusses features with F. W. England, exec. v.p.; R. E. Wolff, asst. sls. mgr.; Fred. Forsgren, Indiana sls. mgr.; and F. T. Johnson, pres. Elgin Metal Novelty Co.

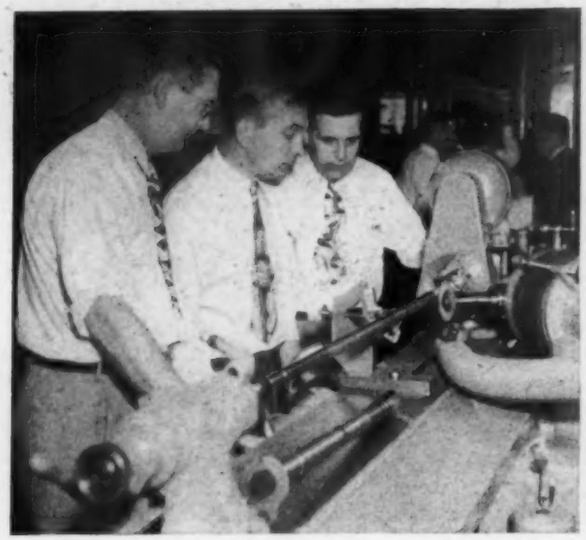
CYLINDRICAL GRINDER of semi-automatic type, 6x18 CTU, is described by M. P. Higgins, pres. Norton Co. to C. Elson, tool supt. Hanna Engr. Wks., F. W. Smith, v.p. Norton, and R. L. Clark, asst. to v.p. Hanna Engineering Works

CENTRALIZED CONTROL of large radial drill is described by Jack C. Carlton, pres. and gen. mgr. Carlton Machine Tool Co. and Frank Moran, v.p. Carlton, to A. F. Murray, wks. mgr. Electrolux Corp.

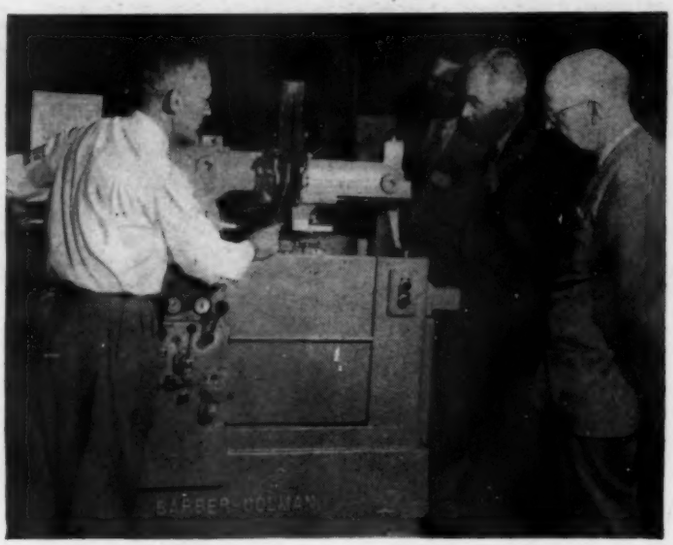


THREAD on steering knuckle is ground by Jones & Lamson 6x30 multi-rib thread and form grinder. J. C. Hebert, sls. mgr. shows part to M. E. Polley, supt. Clark Equipment Co.; H. H. Whitmore, g.m. and J. E. Lovely, v.p. of Jones & Lamson

FINE-PITCH gears and splines are produced to close tolerances on this new Taft-Peirce grinder. G. A. Hoberg, supt. the T-P contract div., listens while W. E. Rogers, sls. mgr. emphasizes a point to Roland Patterson, proc. engr. and J. W. Leavens, wks. mgr., both of Canadian Arsenals Div., Small Arms Dept., Long Branch, Ontario



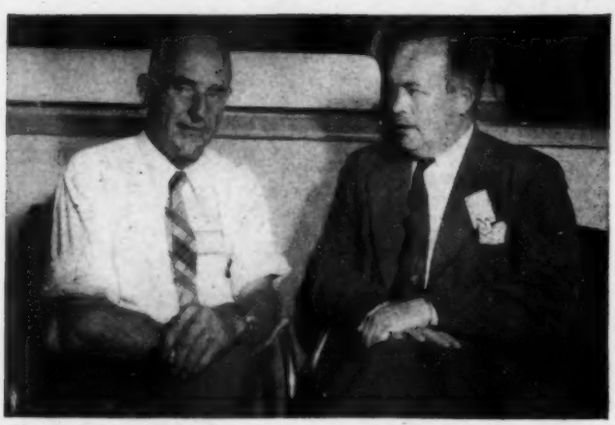
BROACH SHARPENER added to line of American Broach sharpens round broaches to 72 in. length. Watching are J. W. Podesta, v.p. American Broach & Machine Co., Dan Ringis, asst. gen. master mech., and W. M. Engelbrecht, gen. fmn. toolroom Dodge Division, Chrysler Corp.



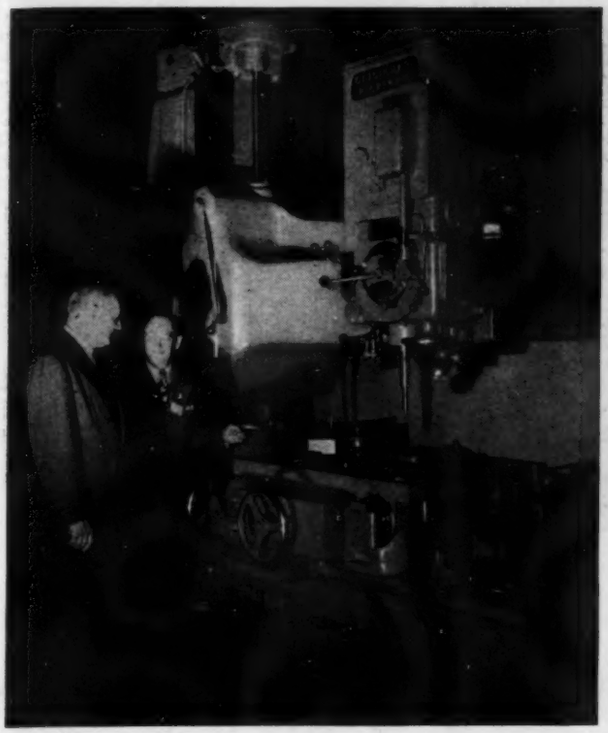
CARBIDE HOBBING with magazine loading on the 8-12 machine is demonstrated by Robert A. Horner, sls. mgr. Mach. & Small Tool Divs., Barber-Colman Co. to R. N. Pinkerton, ind. eng., Capt. M. H. Hubbard, and Walter L. Tann, ch. prod. eng., U. S. Navy. The 8-12 takes work to 8-in. dia. and has a hob-slide travel of 12 in.

HEAVY CONSTRUCTION of RB screw machine (right) is discussed by A. E. Drissner, v.p. and ch. eng. National Acme, S. M. Cooper. 2d v.p. Fafner Bearing, A. E. Henn, mach. sls. mgr. National Acme, C. G. Rosensweig, v.p. and wks. mgr. Fafnir, J. W. Smith, ch. plt. eng. Fafnir, and R. R. Rhodehamel, gen. sls. mgr. National Acme

CANES FOR allcomers were made by Cincinnati Shaper on an 8 ft. all-steel press brake to demonstrate progressive notching, forming and curving. Three operators ran the brake, while hundreds of Show visitors waited in line



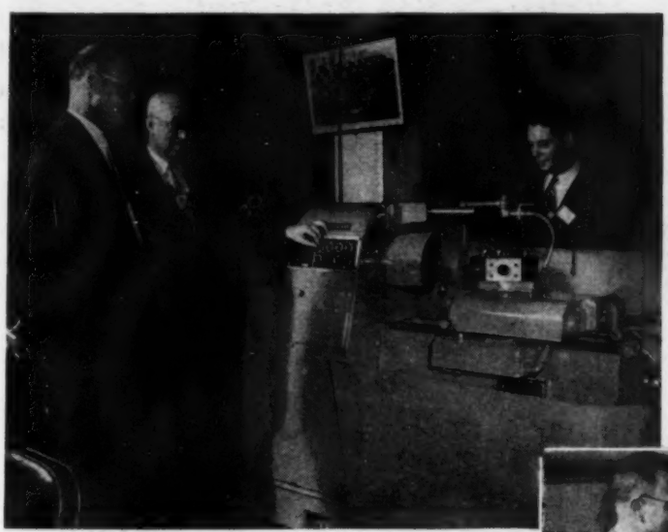
EXPORT POTENTIAL interests Thorvald S. Ross, pres. Rivett Lathe & Grinder and Fred M. Read, pres. & gen. mgr. Amer. Mach. Tool Export Associates



PRECISION DRILLING MACHINE suited for use with an automatic spacing table is discussed by O. E. Schauer, sec. and wks. mgr. and N. C. Schauer, sls. mgr. Cincinnati Bickford Tool Co. Machine arm does not rotate so spacer settings cannot be accidentally lost

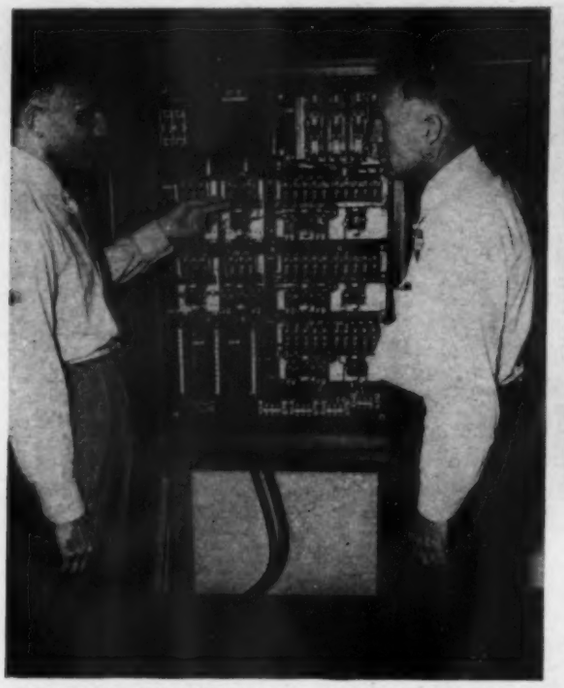
"HY-DRAULIC" DRIVE AND FEED of 36-in. openside shaper is explained by Elmer E. Hallberg, v.p. and Albert Triebel, Jr., v. p. Rockford Machine Tool Co. to David E. Mulholland, mgr. Grinding Machy Div., Birdsboro Steel Co. Redesigned machine built by Rockford reciprocates the work, has stepless adjustment of speeds and feeds

OBVIOUSLY WELL-PLEASED with Show's success are T. C. Stephens, Robert R. Stephens Machy Co.; Swan E. Bergstrom, sls. mgr. Cincinnati Milling Machine Co.; and M. A. Hollengreen, v. p. and gen. mgr. Landis Tool Co.



NO CAMS are used for speed and feed changes in Bardons & Oliver No. 43 automatic turret lathe for chucking to 6 in. People are: Norris Perris, sen. partner, Stevenson Jordan & Harrison, Edwin Huge, v.p. & sls. mgr., Bardons & Oliver, and John Staley, sls. engr., State Machine Tool Co.

FREQUENCY CONVERTER (right) supplies power to high-speed motors. Setup is explained by C. M. Rhoades, Jr., engr. in charge, Machinery Div., General Electric Co., to L. Feeney, plt. engr. Chevrolet Gear & Axle, and K. H. Runkle, mgr. Industrial Div., G. E.



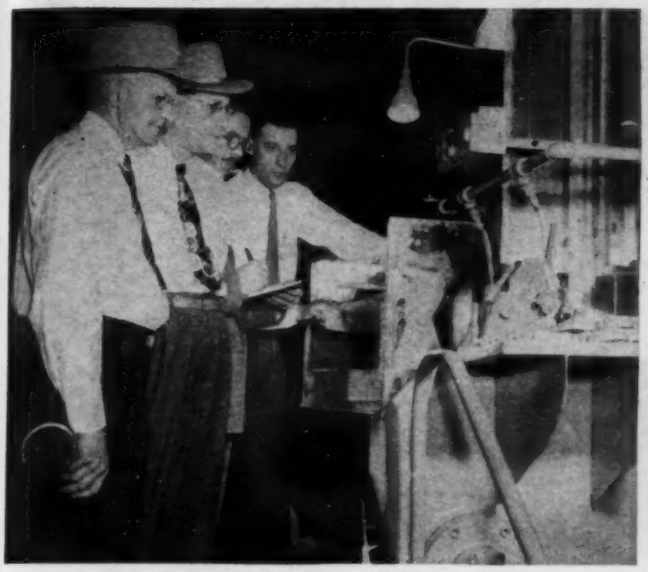
CONTROL CABINET built to the "automotive" specifications in the new American Standard for machine-tool electrification is explained by C. H. Armstrong, asst. district mgr., Detroit off. Clark Controller Co., to H. R. Kelsey, pres. the H. R. Kelsey Welding & Engineering Co., Kenosha

MAIN BEARING CAPS were milled at 160 pcs. per hr. on the Davis & Thompson No. 2A drum-type machine. Those watching performance were: W. Naumann, prod. mgr. Caterpillar Tractor Co.; Perry D. Gasnier, Detroit mgr. Davis & Thompson, and these Caterpillar men: H. Leverette and C. Verkler, mach. shop supts., and R. Connell and F. Pittman, planning supvrs.

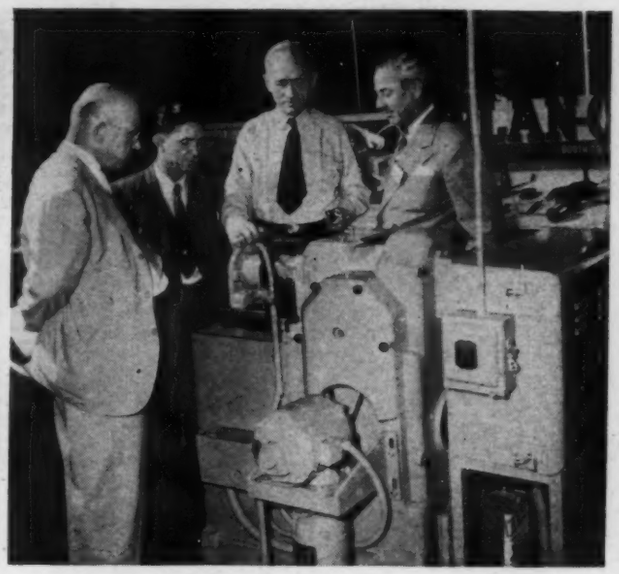
SMALLEST self-contained hydraulic feed unit (right) so far built by Greenlee Bros. & Co. is 7 in. over the ways. Present were R. O. Knudson, sls. engr. Greenlee; E. Gairing, pres. Gairing Tool Co.; D. G. Hawksworth, ch. engr. Gairing Tool Co.; J. M. Macrae, Detroit off. mgr. Greenlee, and J. R. Ponchaut of Belgium

BORING brass valves at 200 pcs. per hr. on the Heald No. 321 Bore-Matic was witnessed by F. Helmel, proc. engr., International Harvester; M. F. McCormick, Chicago mgr. Heald Machine Co.; Roger N. Heald, pres. of Heald, and Gene Laistner, mfg. engr. Electrolux

THREE FACES of the work are machined by this Kingsbury Machine (right) which has 12 chucks, 14 spindles. Observers were: G. W. Gates, plt. layout engr., and J. E. Ekstein, supt., Borg-Warner; and E. J. Kingsbury, pres. and G. Swahnberg, 1st v.p., Kingsbury Machine Tool Corp.

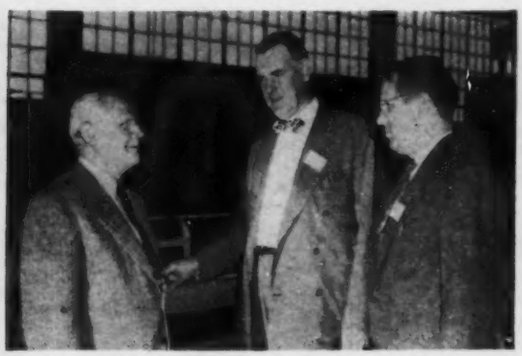


NEW MECHANISM for operating the shuttle tables on Oilgear double-slide broaching machine has simplified design. G. McKellips and A. J. Grieves, Fairbanks, Morse & Co. and J. Donkin, wks. mgr. General Electric Co., Ltd. learn about it from E. H. Krainer, eng. Oilgear Co.



ACCURACY of Plan-O-Mill No. 1 on form and thread milling was demonstrated by J. Hugo Smith (white shirt), pres. Plan-O-Mill Corp., to W. C. Weslow, pres. Diamond Products Inc.; John Walker, gen. fore. Carboloy, and R. G. Michell, pres. Eclipse Counterbore

SADDLE-TYPE TURRET LATHE No. 18 has cross travel for both square turret and hollow hexagon turret. William L. Dolle (ctr.) pres. and gen. mgr. Lodge & Shipley Co. describes controls to B. V. Miller, mach. shop supt. and J. T. Tomlinson, supt. Layne & Bowler. The lathe has 12 forward and reverse spindle speeds and swings 20½ in. over the bed, takes round bars to 2½-in. dia. It is part of Lodge & Shipley's Acme line of turret lathes



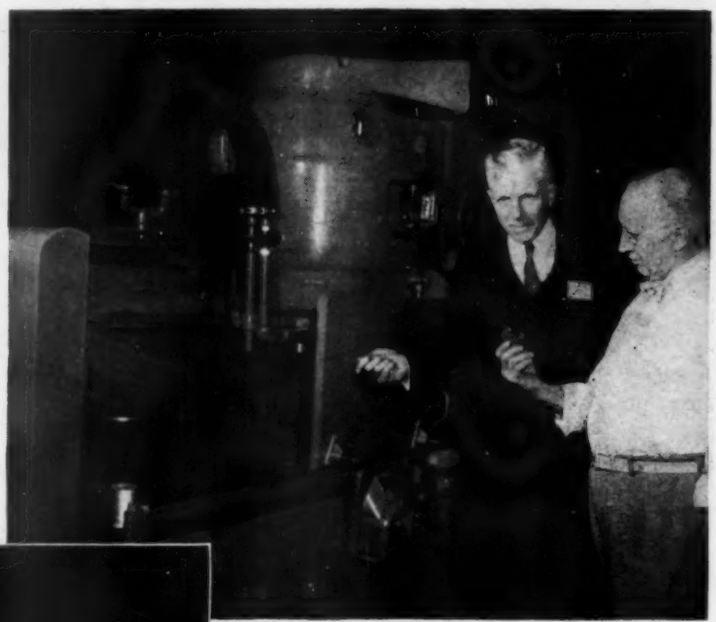
HORIZONTAL PULL BROACHING machine of Lapointe for gun barrels is discussed by Charles Koebel, pres. Koebel Diamond Tool Co., John J. Prindiville, Jr., pres. and Joseph P. Crosby, v. p. Lapointe Machine Tool Co.

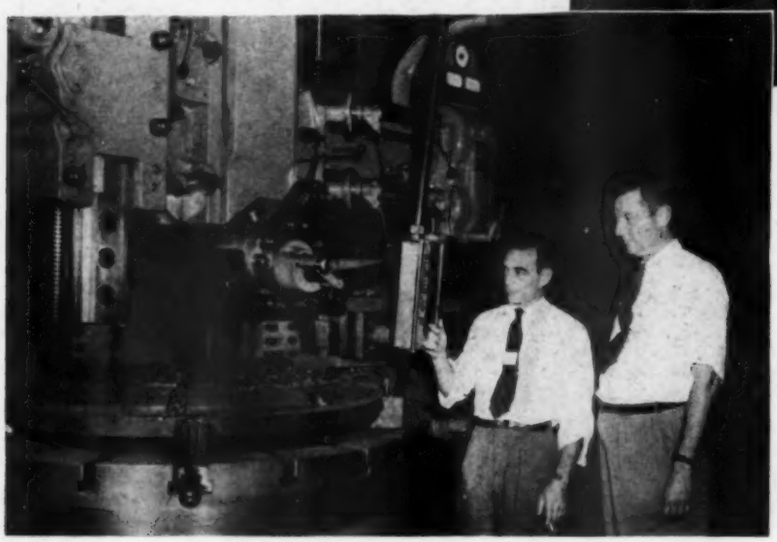
ONE FAVORITE SPOT to relax was the McGraw-Hill booth. Included in this group from Union Twist Drill Co. are (seated) F. H. Nelson, sls. G. F. Holland, pres., Union Twist Drill, and Thornton MacKay, wks. mgr. S. W. Card Mfg. Div.; (standing) F. P. Starrett, sls. Chicago, S. W. Card, and Norman MacKay, asst. supt. for Union Twist Drill

SURFACE GRINDER with hydraulic feed is demonstrated by L. L. Filstrup (rt. of machine) v.p. Covel Mfg. Co. to Clinton Peters, fmn. Grinding Dept., Elgin Mach., A. A. Toppel, sls. mgr. and L. H. McGowen, serv. mgr. Covel, Malcolm Ross, Ross Carrier

AUTOMATIC LATHE Sundstrand No. 4 is for long and short runs on small parts. T. B. Buell, sls. mgr. Sundstrand Machine Tool Co. explains operation to Arthur Burgan, Burgan Machy Co., W. L. Montooth, mfg. eng. Westinghouse Elec. Corp., and Milton R. Hoeppner, mstr. mech. McCulloch Motors

VOICE CONTROL for demonstration purposes was used on Natco A-42 electronic mechanical unit. E. E. Opel operates the A-42 for J. A. Dorsner, plant supt., Nuttall Wks. Westinghouse and E. D. Frank, v. p. National Automatic Tool Co.



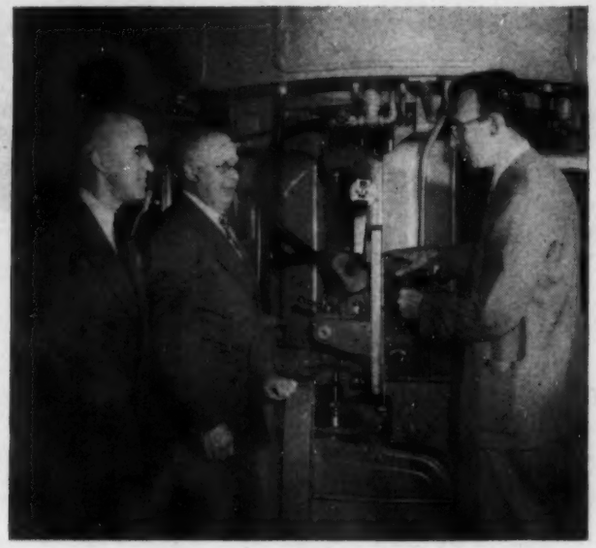


SURFACE GRINDER No. 18 with rotary magnetic chuck which has power traverse from loading to grinding position and back is discussed by D. R. Weedon, asst. mgr. The Blanchard Machine Co. with L. H. Swind, pres. Swind Machy Co. Work can be 36-in. dia. and 12-in. high on this machine built by Blanchard

←

BORING MILL in King's 52-in. size with two railheads and one sidehead has 35-hp. Westinghouse variable-voltage drive. At the pendant control is D. W. McGill, mchy. electrification mgr. Westinghouse Elec. Corp. with C. F. Muller, pres. King Machine Tool

AUTOMATIC PISTON BORING machine rough and finish bores wristpin holes in 30 sec. Phil Huber, pres. Ex-Cell-O Corp., L. D. Rigdon, mgr. Hq. Mfg. Dept., Westinghouse Elec. Corp. and Thor Olson, v. p. Ex-Cell-O examine finished piston from this Ex-Cell-O machine in which bores are held to 0.0003 in.



8-SPINDLE HOBBER No. 7-A can have each spindle tooled for the same or a different job. H. S. Warner, v. p. Lees-Bradner Co. and R. A. Bowerman, mech. engr. Louisville Wks., International Harvester watch J. A. Bradner, pres. Lees-Bradner demonstrate operation

6-SPINDLE CONOMATIC for high-speed work from 1-in. bars produced two mating parts. George E. Graf, prod. mgr. and I. F. Fleitz, gen. supt. Henry Vogt Mach. Co. get the story from H. P. Chaplin, treas. & gen. mgr. Cone Automatic Machine Co.

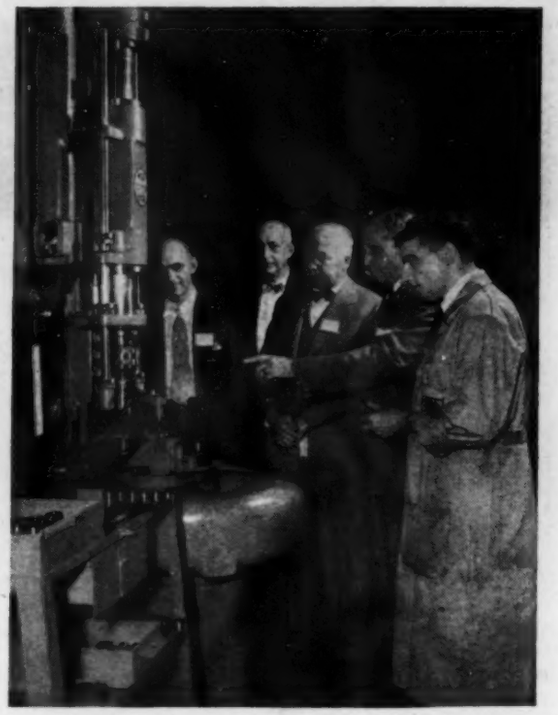
CONSTA-CONTAC grinding is new method bringing several workpieces into contact with grinding wheel at once. Paul Smith, treas. and sales manager and Gardner S. Gould, pres. (ctr.) Fitchburg Grinding Machine Corp. describe this development to J. C. Helveston, mgr. plt. 1, and R. V. Keck, mgr. plt. 2, Saginaw Steering Gear Div., General Motors

HYPERMATIC punch press demonstrated at 1150 strokes per min. punched four holes per stroke in steel strip. Frank J. Parrett, Hoffmann Mfg. Co., England, Frank J. Schwab, v. p. Lempco Products, and Wm. H. Lyon, plant supt. Norma-Hoffman Bearings are inspecting the Lempco machine with cover removed

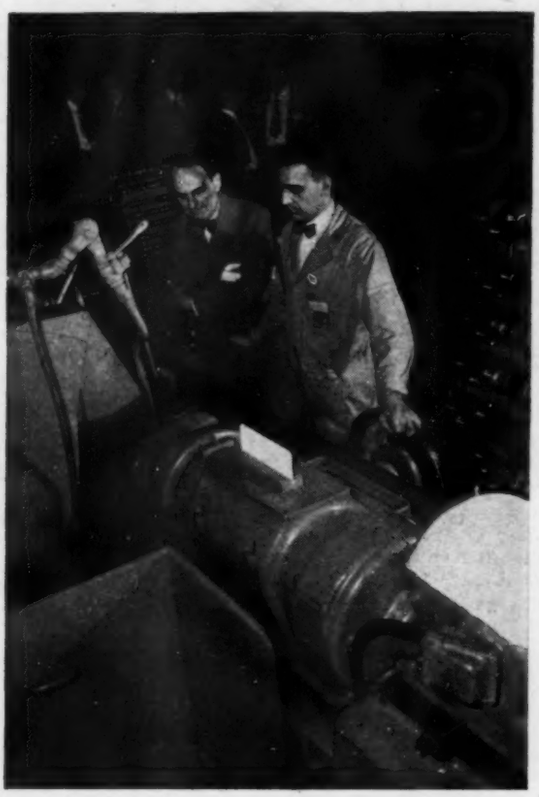
ELECTRONIC CONTROL of table travel which has been added to No. 1830 jig borer is explained by A. G. Bryant (rt. of machine) v. p. Cleereman Machine Tool Co. to Arthur C. Johnson, Supt., Chester A. Lender, fmn., and Andrew H. Fannan, fmn., Magneto Div., J. I. Case Co.

AMONG HARTFORD builders seen at the dinner given by Distributors' Assn. were E. A. Hanson, pres. Hanson-Whitney Mach. Co. and Wm. W. C. Ball, v. p. & gen. mgr. Taylor & Fenn

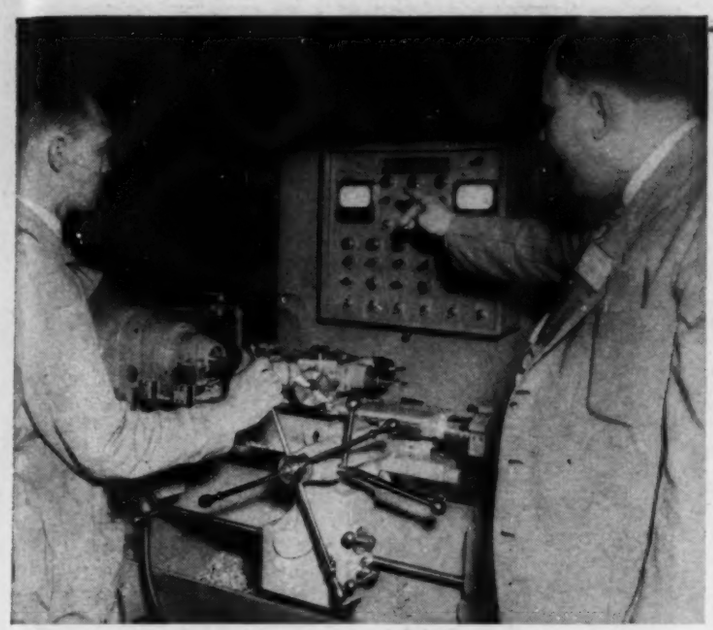
CONSTANT MACHINE FEEDS, said W. R. King, mgr. sls. Machine Tool Sect., General Electric, can be secured without overtravel, also quick stop and reverse, through the electronic amplidyne adjustable-speed drive. Vistors were: A. J. Wagner, supt. tube mill, and P. W. Koenemund, ch. engr., Wheeling Steel



EXTERNAL HONING of compressor pistons on the Micromatic Model 721 Hydrohoner held the interest of A. W. Crawford, master mech., Clayton, Mark & Co.; Clarence W. Daniels, plt. engr. & dir., and Wallace T. Montague, v.p. Norton Co., and K. W. Connor, pres. and R. Berahya, Micromatic Hone



AUTOMOTIVE APPLICATIONS of machine tools were emphasized in many exhibits, particularly production increases as high as three to one. Here W. L. Batt, pres. SKF Industries, watches a Landis semiautomatic crankpin grinder go through its paces



ELECTRONIC FEED and speed changes, preselected, automatically control the Speedi-Matic hand screw machine. K. T. Kuck, ch. engr., Monarch Machine Tool Co., points out the control panel by which nine speeds and six feeds can be applied to a specific job consisting of 25 to 500 or more pcs. Setup time is only a matter of seconds per speed or feed

GEAR FINISHING methods attracted the attention of many Show visitors. Here P. W. Christensen, Jr., pres., Cincinnati Gear Co., discusses the Model GCU National Broach diagonal gear shaver with Ben F. Bregi, exec. engr., National Broach & Machine Co.

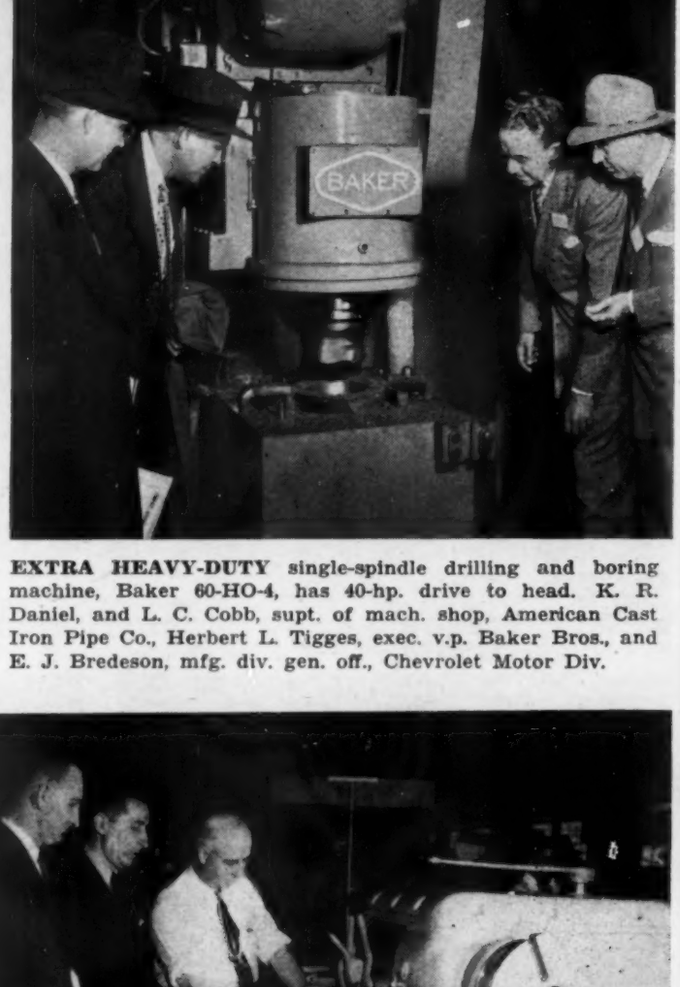
NEW MANUFACTURING processes make it possible to apply the Supermetric finish to ground thread chasers, thereby increasing their life up to 10 times. A. S. Redway, v.p. and gen. mgr., Geometric Tool Co., explains advantages to Hugo Lindahl, dir. A. B. Aug. Lindahl, Sweden

OIL-TIGHT pushbuttons, (upper right) demonstrated by J. W. Mellon, ch. engr., Allen-Bradley Co., keep electrical circuits clean, cut maintenance. These features interested A. F. Gehrke, eng. and D. E. Nystrand, ch. engr., Paper Converting Machine Co.

INSTANTANEOUS TOOL RELIEF permits reversing rotation of feed at any time on new AR Lo-Swing lathe. Watching are G. E. Fogarty, v.p. and sls. mgr. and John A. Fyfe, v.p. Seneca Falls Machine Co.; Rene Guffon, mgr. MAP, Paris; E. R. Smith, pres. Seneca Falls Machine Co.

THE WORLDS LARGEST MILLING CUTTER
DIAMETER 91 WEIGHT 18000 LBS.
USED ON AN 800 H.P.
ALUMINUM INGOT SCALPING
MACHINE WEIGHING 225 TONS

SCALPING OF aluminum ingots is done with this huge cutter. G. R. Gison, sls. mgr., Ingersoll Milling Machine Co., told Joseph Olender, master mech. International Harvester Co., Indianapolis, that the 91-in. diam. tool weighs 18000 lb.



EXTRA HEAVY-DUTY single-spindle drilling and boring machine, Baker 60-HO-4, has 40-hp. drive to head. K. R. Daniel, and L. C. Cobb, supt. of mach. shop, American Cast Iron Pipe Co., Herbert L. Tigges, exec. v.p. Baker Bros., and E. J. Bredeson, mfg. div. gen. off., Chevrolet Motor Div.

TOO INTERESTED in the Show to reflect on 60 years' experience with the metal working industry, Fred H. Colvin, editor emeritus, *American Machinist*, renewed old friendships, eagerly sought new ideas.

24-SPEED ENGINE LATHE of heavy-duty design, 25 in. x 14 ft., interests Peter Millenaar, v.p. I.B.I.V. Buying Service and G. F. Kuypers Wentink, mgr. Amsterdam Office, I.B.I.V. as W. H. Jackson, v.p. Axelson Mfg. Co. shows range of 81 feeds on this large Axelson lathe

SMALL PARTS are formed and drilled on the Taylor & Fenn M-109 automatic (left). From right to left—Charles Rollins demonstrates to J. S. Sides, v.p. & g.m., Joshua Hendey Corp., and these Crocker-Wheeler men: C. A. Butcher, v.p. & g.m.; R. J. Penny, Chicago mgr., and F. W. Mencik, wks. mgr.

Machine Exports at All-Time High

NEW YORK—The United States has poured machinery into other countries this year at a rate almost five times that of prewar years. A study of exports made by McGraw-Hill Department of Economics reveals that shipments of industrial machinery in the first six months were valued at $658 million. This is about double that of last year.

Along with foodstuffs, machinery shares top billing on the U.S. export list.

Perhaps no other commodity is spreading throughout the postwar world as is U. S. machinery. The McGraw-Hill study indicates that almost all areas that have any sizeable manufacturing have been in the market for some type of equipment. Exceptions, of course, are Germany and Japan, both of which formerly were good customers. Eastern Europe is another exception. Russia, however, continues to be a heavy buyer, spending more than twice as much this year as before the war.

Canada No. 1 Customer

The No. 1 customer for American machinery still is its neighbor to the north, Canada. That country spent about $101 million on production equipment during the first half year. Countries south of the border also held to their position as principal buyers. Mexico, Brazil, and Argentina, (in the order named) have been in the market for an extraordinary amount of equipment. Argentina, in particular, has risen rapidly and is spending four times as much this year as last. Even so—and in spite of its ambitious five-year plan—Argentina still is taking less equipment from this country, than Brazil. Other good customers, particularly for certain specialties, include Venezuela, Colombia, Cuba, and Chile (again listed in the order of their importance).

British Buying Light

Export of machinery to the Marshall plan area also has been large when contrasted with prewar years. However, the McGraw-Hill study points out that except for France, shipments have been much smaller than might have been expected in light of the needs that exist. Britain, for example, spent less in this country on machinery than did Venezuela during the first six months. And purchases by the Lowlands and Italy were negligible. But France emerged as the nation's second best customer, largely because of aid in the form of loans from this country and the World Bank. The French outlay of $58 billion in the first six months was some 13 times the prewar rate.

Makers of all types of machinery have shared in the extraordinary demand that has arisen from every part of the world. However, it is in industrial equipment that the widest advance has occurred. Manufacturers have sought to replace and expand their facilities after the long drought of the war; and it is the long list of items they use that contribute the most spectacular gains.

Deliveries Behind Demand

The McGraw-Hill study points to textile, sewing, and shoe machinery as a good example. Prior to the war this equipment was not an important element on export lists. But in the first half of this year shipments totaled $62 million, some eight times the prewar rate, and customers in many countries still are queued up waiting for delivery or even to get on order books. It is of some significance that Canada and the American Republics are far and ahead the largest buyers of machinery for these and other consumer goods industries. Europe has not been a heavy purchaser. Nor have the countries that are listed within the British Empire's sterling area. Although the latter group are on the upgrade in industrialization and need such equipment, they have lacked dollar exchange. The result is they have ordered from Britain what equipment they have been able to get.

Engines, Turbines Sought

Engines and turbines are another type of equipment reported to be in extremely heavy demand. Exports in the first six months were $242 million, almost thirteen times the prewar rate. Nevertheless, this is the one type of equipment that has failed to show an advance over 1946. But exports this year are being more widely distributed than they were last year, when France spent the tremendous sum of $110 million on engines and turbines. France still stands at the top of the customer list, but its outlay has dropped to about half the 1946 rate. Canada occupies the number two spot for this equipment (shipments in the first six months were $14 million), with Brazil and Mexico also well up on the list.

However, it is China that follows immediately behind Canada. That unsettled land spent some $13 million for engines and turbines in the first six months, by far its largest outlay on any type of U. S. machinery. As with other equipment, purchases by Britain and countries within the British Empire were relatively small.

As was to be expected in a period of wide industrial reconstruction and revival, shipments of machine tools and other metal-working machinery also are riding along at a relatively high level. The total of $107 million for the first six months is up about one-third from the 1946 rate. The gain here is somewhat smaller than with certain other types of industrial equipment, particularly in contrast

New Customers

NEW YORK—The growing importance of the American Republics in the machine tool export picture is of greater significance than the fact that Canada and France now share second place to Russia in this field.

Prior to the war, shipments flowing south of the border were negligible. Now, close to one-fifth of the total foreign shipments are sent into these countries.

High Priority

NEW YORK—The dollar shortage which has hit a number of countries is unlikely to seriously reduce exports of machinery from the United States, the McGraw-Hill survey indicates.

Although rationing the dollar carefully, most countries have placed machinery high on their list of preferences.

Exports of Industrial Machinery

With principal countries of destination (in millions of dollars)

	1947 (1ST 6 MOS.)	1946 (12 MOS.)	1938 (12 MOS.)
Total Industrial Machinery	$658.4	$842.0	$269.9
Canada	101.4	133.5	31.3
Mexico	47.8	77.8	7.2
Brazil	45.5	52.9	6.7
Argentina	33.1	14.8	6.9
Chile, Colombia & Venezuela	66.6	69.3	21.5
China and India	43.9	20.4	5.6
France	58.3	157.0	9.0
U.S.S.R.	48.3	115.9	40.2
United Kingdom	22.2	24.0	28.0
Norway and Sweden	18.2	11.8	4.0
The Lowlands	15.0	18.6	3.4
Greece and Turkey	11.4	7.4	1.2
Australia and New Zealand	9.2	7.1	8.1
Union of South Africa	16.4	15.8	7.6
Metalworking Machinery	106.7	165.7	101.7
Canada	11.9	18.7	5.1
Mexico	4.6	8.5	.3
Argentina and Brazil	9.8	12.5	1.1
Chile, Colombia & Venezuela	4.1	3.9	.6
China	4.4	2.2	.2
France	12.0	29.3	5.8
United Kingdom	7.7	9.9	15.6
U.S.S.R.	13.6	41.3	35.2
Sweden	5.4	5.8	.9
The Lowlands	6.1	5.4	1.6
Engines, Turbines, and Parts	121.2	247.7	17.6
Canada	14.3	19.9	3.2
Mexico	5.6	19.7	2.1
Argentina and Brazil	14.9	14.9	1.6
Chile, Colombia & Venezuela	9.2	7.7	2.1
China	13.4	2.1	1.2
France	26.1	110.6	.1
U.S.S.R.	4.7	36.0	.9
Textiles, Sewing & Shoe Machinery	61.7	57.4	15.3
Canada	10.8	13.9	3.5
Mexico	5.7	6.8	.2
Argentina & Brazil	12.1	10.5	1.1
Chile and Colombia	6.1	5.8	1.0
China	2.5	1.8	.1
United Kingdom	3.7	2.6	3.1
France & Sweden	2.3	1.8	.5
Construction & Conveying Machinery	91.6	84.4	23.9
Canada	19.8	23.8	4.1
Mexico	5.2	8.1	1.0
Argentina & Brazil	15.3	8.1	2.6
Chile, Colombia & Venezuela	9.5	8.5	2.4
France	6.4	6.9	.4
U.S.S.R.	4.1	5.4	.1
Mining, Well & Pumping Machinery	87.5	101.7	63.6
Canada	8.2	9.9	4.9
Mexico	5.8	8.6	1.8
Venezuela	17.1	19.1	7.5
Argentina, Brazil & Colombia	9.9	9.9	6.3
Netherland Indies	3.1	.8	4.0
India & Saudi Arabia	3.7	4.0	2.1
China	2.7	2.6	.03
France	6.1	3.3	1.1
U.S.S.R.	9.2	13.9	.8
Other Industrial Machinery	189.7	185.1	47.8
Canada	36.2	47.4	10.6
Mexico & Cuba	26.1	32.2	3.0
Brazil & Argentina	20.2	17.7	4.6
Venezuela, Chile & Colombia	14.8	15.8	2.9
China & India	12.3	5.9	1.3
U.S.S.R.	15.9	18.7	3.0
France	6.3	5.9	1.2
United Kingdom	5.8	5.4	6.1
Sweden	4.3	2.0	.9
The Lowlands	5.0	1.8	.8
Union of South Africa	6.6	6.4	1.6

with prewar days. This is not unexpected, however, in the light of heavy shipments during the war and the surplus tool disposal program that followed.

Russia in Lead

As before the war, Russia is the heaviest purchaser of U. S. metalworking machinery ($14 million in the first six months). Canada and France now share second place ($12 million each), although French buying has dropped sharply from last year with the tapering off of its tooling up program. But of wider significance is the growing importance of the American Republics in the machine tool export picture. Close to one-fifth of the total foreign shipments has been flowing to countries south of the border this year. Prior to the war shipments to this area were negligible. China also has stepped up its buying and India looms slightly larger than it did in prewar days. Britain, on the other hand, is buying less than in 1938.

Venezuelan Imports Great

Two other broad groups of machinery are reported as running neck and neck in the export market. They are construction and conveying equipment; and mining, well, and pumping machinery. Shipments in each of these catch-all categories ran to about $90 million in the first six months. Here again it is the busy countries of the Western hemisphere who are the outstanding buyers. The oil land of Venezuela is at the head of the list for mining, well, and pump machinery; and it is also a heavy buyer of construction and conveying equipment. Canada and Mexico are other large customers for these general lines. Argentina and Brazil, on the other hand, have made substantial purchases only of construction and conveying equipment. Within Europe, France has been the only large buyer. Further East, however, Russia has taken very sizeable shipments of both lines.

Demand Seen Continuing

The McGraw-Hill study concludes that these heavy shipments of almost all types of machinery are likely to continue for some months. While the dollar shortage that has struck a number of countries must eventually have some effect on machinery exports, its immediate impact has not been great. Most countries that are now rationing scarce dollar exchange have placed machinery high on their list of preferences. Moreover, exports to Western Europe under the Marshall Plan are expected to offset declines that finally are bound to appear in buying by Canada and Latin America.

Gaging Business

$400 Million for 1948?

Machine tools sales have been given a tremendous lift by the Machine Tool Show which far exceeded the industry's expectations in attendance, enthusiasm and inquiries.

▸ For the first time in the history of the industry's shows, the volume of orders turned up the week preceding the opening of the show at the Dodge-Chicago plant. That in itself was an indicator of good business to follow.

▸ It now appears that fourth-quarter bookings may be heavy enough for machine tool builders to close the year with a total of new orders of almost $300 million, or considerably more than was anticipated. This forecast means that in the final three months of 1947 sales will outstrip shipments. If so, it will be the first time since the war days that such a situation has occurred in the industry

▸ Machine tool builders also have raised their sights for 1948. It now is conservatively estimated that business next year will be $350 million, topping 1947 by $50 million. Some reliable observers even go so far as to predict a $400 million year. In any event, the consensus of opinion is that 1948 will be better than 1947.

Foreign Demand Anticipated

Foreign purchases of machine tools should be reasonably well sustained, despite dollar shortages. Some sizeable orders have been placed by Poland and Czechoslovakia as a result of funds made available by the Export-Import Bank. Machine tools are being bought in this country for a new roller bearing factory in Switzerland.

Tool Buying Tightens in Detroit

A mild tightening in machine and tool buying appears to be developing in Detroit, born more of decisions as to how to spend money rather than as to when forward programs will be set into action.

▸ The element of cost and price, Detroit feels, cannot help but develop somewhat further as quotations begin to increase. Many factors in the machinery field have remarked in recent weeks that price-cutting is operating in automotive tooling procurement. Shops which need business apparently find it more worthwhile to trade dollars, or come close to it, than to close down.

Natural Gas Outlook Dark

Gloomy predictions by industrial and governmental natural gas experts indicate that it will be at least four years before there are enough pipelines to meet even the present demand in the East and Midwest.

▸ And, despite the multi-million-dollar construction program of the natural gas industry, the acute shortage of the fuel will get worse before it gets better.

▸ Another factor of growing importance is a new reluctance on the part of well owners to sign new contracts with pipeline companies. This is a development of the political battle over federal regulation.

Delivery Pressure Mounts

Pressure for deliveries of steel in Pittsburgh has tended to increase. One factor involved in this is the railroads' demand for an emergency freight increase and follow-up freight boost. Another is the possibility that under the Marshall Plan there may be an emergency allocation of steel to Europe to get the productive machinery going faster over there.

▸ Some steel interests, on the other hand, believe that the normal decline in exports will provide a cushion for steel under the Marshall Plan without affecting the domestic economy.

Employment Stabilized

In line with the national trend in other industries, employment in the machinery industry was more stable in July than in June. In electrical machinery, 33 were hired and 34 separated for every 1,000 employed in July. June figures were 38 hired and 44 separated.

In other machinery there were 35 hired and 38 separated for every 1,000 in July. Comparable figures for June were 52 hired, 42 separated.

Russians Nervous on Exports

Exporters to Russia are getting nervous about a crackdown. They fear the Marshall Plan will interfere with the $100 million business they have done this year, mostly in heavy machinery.

Despite rumors, no general cancellation of export licenses is in the works. But West European needs for scarce capital goods will get preference over orders from the wrong side of the curtain.

Exporters now are trying to write clauses into new contracts waiving responsibility for delayed deliveries. The Russians, however, won't go along with this.

James Forrestal, New Secretary of Defense, is shown with many of the men who will be responsible for the security of the nation as he took the oath of office in Washington recently from Chief Justice Fred M. Vinson. Left to right: Secy. of the Army Kenneth C. Royall, Gen. of the Army Dwight D. Eisenhower, Secy. of the Navy John L. Sullivan, Fleet Adm. Chester W. Nimitz, Secy. of the Air Force W. Stuart Symington and Commanding Gen. Carl Spaatz, Army Air Force

Detroit

PACKARD CUTS PRICES ON SOME 1948 MODELS . . . FORD PREPARES FOR CHANGEOVER . . . NASH-KELVINATOR FORMS PLASTIC DIVISION

Packard First on 1948 Model

The automobile pot bubbled merrily in early October. Expansions, new models, labor matters and other operations made a full budget of news.

Packard became the first to unveil its 1948 automobiles, and it did so with the pleasing tidings that prices on several of the 17 models of its line were lower than for comparable 1947 jobs. The reductions, however, were balanced by a few advances, mainly on models whose quotations had not changed in past advances.

Powering its new lines are three straight-eight engines, turning up 130, 145, and 160 horsepower. Tooling for these jobs, done quietly and gradually over the past 18 months, was long since completed.

Also of interest in the new Packards, which represent the major share of a postwar $20-million company development program, is a new station sedan of all-steel construction. The second of two full-size seats inside virtually disappears into the floor and back of the front seat, affording about nine feet of usable length stretching to the end of the opened tail-gate.

Hudson Completing Changeover

Hudson Motor Car Co. is completing a short changeover which will result in the most marked revisions made by the company in its 38-year history. Foremost among these is a new integrated chassis-and-frame construction.

This type of construction, already seen in past years in the Nash and Lincoln-Zephyr lines, makes possible the lowest cars on the market today. They stand but five feet from pavement to top. At the same time, advance notices promise the roomiest seats in the industry, and the most headroom on any mass produced car.

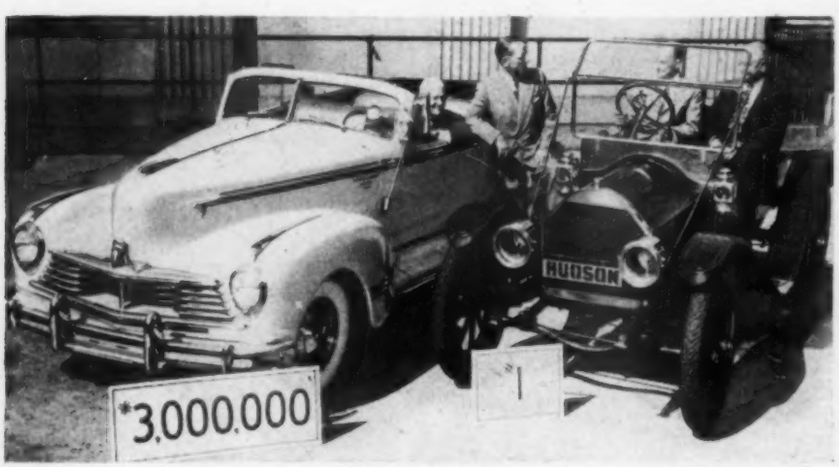
"You step down into the new Hudson," say company officials, "not up on them."

A brand-new super-six engine will be available for the new cars of this manufacturer, along with a considerably revised super-eight. Other changes will be withheld until the new cars make their appearance, in the near future.

Other companies give no indication that they will move quickly into new model production. What may be a straw in the wind, however, comes out of the Rouge, where Ford is quietly curtailing some departments in preparation for changeover. These moves are not yet significant, but they do reflect the beginning of the cutbacks which begin to appear at the end of the model year.

Ford Leases Plant

Ford, meanwhile, is preparing to expand in several directions. Its most notable move was the long-term lease signed for the Naval Ordnance Plant, in Centerline, on the northeast border of Detroit. This 1-million foot plant, including 15 buildings, will largely be self-contained for manufacture of parts and assemblies for the 1948 models, both cars and trucks. It will also provide for parts and accessories of the sales division.



Three Millionth Car produced by Hudson Motor Car Co. stands beside Hudson No. 1, a 1909 model. Shown (left to right) are A. E. Barit, Hudson president; N. K. Van Derzee, sales manager, G. H. Pratt, vice president in charge of sales, and John V. Machesky, supervisor of experimental machine shop

Auto Men at Show

DETROIT—Large delegations of automotive manufacturing personnel attended the Machine Tool Show in Chicago for the purpose of looking over the latest designs and their application in the building of new motors for 1949 or 1950 models.

They took the opportunity of discussing their problems with machine tool builders with the idea of cutting costs on later models through the reduction in machining time with the latest production equipment .

Some 4,000 persons will be on the payroll when operations roll at full blast. But there is no expectation that this total will be reached during 1947, inasmuch as about 2,400 freight carloads of government-owned equipment have to be moved out before work can be transferred from the Rouge and elsewhere.

Ford has also obtained approval for purchase of a war surplus forging plant at Canton. This is a comparatively small unit, but a payroll around 1,000 persons is expected. Forgings for cars, trucks, and tractors will be manufactured at this site. Both the Canton and Centerline moves are said by Ford officials to be part of their long-range expansion program, which is also being manifested by construction of four major new assembly plants and other operations.

Plastics Division Established

Nash-Kelvinator Corp., looking ahead to broadened refrigerator output, has established a Plastics Division in an existing N-K plant at Milwaukee. Some of the largest and most modern plastic injection molding machines have been installed, putting the new operation in a fairly select class. Large plastic parts are being produced for Kelvinator refrigerators.

On this score, it should also be noted that the company is contemplating a widened use of aluminum on its 1948 model refrigerators, in place of steel.

Kaiser-Frazer has run through a worthwhile milepost on its corporate journey, by producing, on Sept. 25, its 100 thousandth car. By any standard—regardless of costs, qualities, or anything else—this is a most noteworthy performance. A bet that K-F would not have progressed that far by now would have gotten good odds in Detroit 18 months ago.

Production and Machine Tool Show Success; Annual Exhibit Possible

CHICAGO—Covering a wide range of machine tools and accessories, the Production and Machine Tool Show in the International Amphitheater here attracted an estimated 10,000 visitors during the period of Sept. 16-27.

Exhibitors generally reported that business was excellent, as most of those attending were interested in placing orders and not attracted merely by curiosity or general interest.

Although not large in extent, the exhibits ranged from standard machine tools to presses, die-casting machines, welders, grinding wheels, small tools and accessories. All were in actual operation.

The largest exhibit was that of Cosa Corp. which showed a full line of Swiss machines. Several of these were entirely new to the American market and attracted widespread interest. Particularly interesting was the Hydropic jig borer and milling machine in which the conventional lead screw for the table has been eliminated in favor of a hydraulic table drive. A two-coordinate measuring system, including built-in precision scales and micrometer microscopes, permits setting to a guaranteed accuracy of 0.0002 in. without the use of the conventional gage blocks. A stepless range of power feed is available for milling operations.

A machine for grinding the profile of form milling cutters also attracted considerable attention. Produced by Oerlikon, it uses a simple sheet metal template attached to the two swinging arms that carry the tool. It can be operated by unskilled workers.

Highly unusual was a universal projector for the profile gaging of intricate parts. Light is cast from below the work and is reflected to the viewing screen by a sealed-in mirror. This permits the surface examination of parts or assemblies, as well as the conventional shadow check, or, in the case of translucent objects, a simultaneous examination of both profile and surface.

The complete line of Hobart welders was on display, including portable models, fixed installation and battery chargers. Canedy-Otto Mfg. Co. showed drill presses, ranging from small bench-type sensitive drills to a radial model. Grob Bros. displayed band saws in a wide variety of types and sizes.

Lathes were exhibited by Logan Engineering Co. together with a small shaper, a swing cut-off saw and a very effective aridifier for removing moisture and dirt from compressed air. Boyar Schultz Corp. displayed several surface and precision grinders as well as a line of screw machine tools. Large, medium and small presses, brakes, shears and other sheet metal working tools were in evidence, together with numerous collet chucks, drills and tapping devices. Also noted was an attachment for performing milling operations on small lathes

The Sheldon Machine Tool Co. also showed lathes, as well as shapers and milling machines. The Diamond Machine Tool Co. exhibited milling machines and presses. A pressure die casting machine by DCMT Sales Corp. demonstrated the practicability of installing a self-contained unit in a small shop.

A unique exhibit was that of the Do-All Co., consisting of a band saw built on a frame of transparent plastic which permitted a clear view of the operation of the various components.

Although not comparable in scope to the National Machine Tool Builders Show, the exhibits served an excellent purpose, and it is not unlikely that this may develop into an annual affair offering space to manufacturers of equipment not strictly classified as machine tools, and particularly to foreign machine tool builders who lack other ways of displaying their products.

Scores of Hydraulic Presses, ranging up to 5,000 tons, are located in this craneway bay extending the full depth of General Electric's new Laminated Plastics plant, Coshocton, Ohio. The building was designed to meet requirements of complex and closely-controlled processes in the laminated plastic manufacture of everything from gears and bearings to insulators and refrigerator door panels

Chicago Worried By Rail Problems

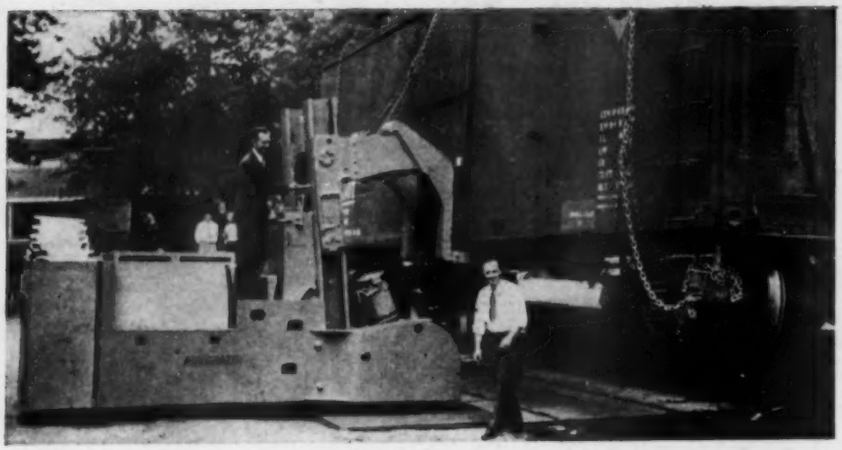
CHICAGO—Almost every aspect of the railroad transportation picture has Chicago area metalworking executives worried these days. They feel the proposed 38% increase in freight rates in Official Territory would hurt Chicago region business. They oppose on similar grounds the proposed hikes in less-than-carload (l. c. l.) rates in this territory while other regions would be unaffected. They fear that the boxcar shortage is quite likely to force some plant shutdowns this winter. And, finally, the grave shortage of open top equipment raises the specter of a coal famine.

Chicago shippers bitterly oppose the freight rate rise of 38% when other territories would be raised only 28%. The general sentiment is that Chicago should be made the dividing line on freight rate increases (the dividing line East-West is now the Mississippi).

The planned l. c. l. increase would also harm Chicago. The hikes of as much as 110% would affect only Official Territory; interterritorial shipments would not be increased. So, again, shippers outside the area would be the gainers.

Meanwhile the tight shipping situation in prospect is causing concern. While no official estimates have been released, it is likely that Chicago area metalworking firms will need about 10% more freight cars this fall than a year ago, when cars were so scarce that goods piled up in warehouses. The likelihood of at least some temporary plant shutdowns in the next few months is considered practically a certainty.

Despite soothing words from coal producers, both Chicago and Milwaukee firms fear a coal shortage which would further complicate matters.



Forty-Five Thousand Pounds Of Box Car is lifted by the world's largest fork and ram truck, the new Automatic Skylift Giant produced by the Automatic Transportation Co. It has a capacity ranging from 10 to 30 tons. The height to which the box car was lifted is evidenced by the service engineer standing under the edge of the car

Machine Tool Distributors Elect D. N. Macconel 1947-48 President

CHICAGO—Continued observance of the organization's code of ethics, now that a competitive market is back, was stressed at the 23d annual meeting of the American Machine Tool Distributors' Association at the LaSalle Hotel here Sept. 15.

Other high spots were:

Progress reported in setting up training courses for sales engineers, in conjunction with the National Machine Tool Builders' Association, in colleges and in the machine tool industry itself.

Selection of Los Angeles as the site of the 1948 spring meeting, the first national meeting on the West Coast.

Staging of the biggest dinner meeting in the Associations' history, with Fulton Lewis, Jr., noted radio commentator, as principal speaker.

The dinner occured on Sept. 17 as the opening session of the Machine Tool Congress, held nightly during the Tool Show.

George Habicht, president of the association and president of Marshall & Huschart Machinery Co., Chicago, presided at all sessions.

D. N. Macconnel, president Machinery Sales Co., Los Angeles, was elected president of the association for 1947-1948. Other new officers are:

Robert L. Giebel, Giebel, Inc., New York City, first vice president; O. W. Johaning, Colcord-Wright Machinery & Supply Co., St. Louis, second vice president; C. C. Brogan, W. E. Shipley Machinery Co., Philadelphia, secretary-treasurer.

New directors for a three-year term are Edward F. Stoss, George Keller and Wilson Radcliffe.

No distributor should offer more for used machines taken as trade-ins on new machines than they are intrinsically worth, said Mr. Johaning, in reporting on the code of ethics long adhered to by the industry. He stressed that when a sales engineer wishes to leave an employer who has gone to great expense to train him, in order to join another distributor, the original employer should be given the opportunity to protect his interest.

Reports of the overhead expense research committee by E. P. Essley, E. L. Essley Machinery Co., Chicago, of the committee on statistics by E. B. MacDonald, Syracuse Supply Co., Syracuse, N. Y., and of the sales and service committee by George J. Keller, George Keller Machinery Co., Buffalo, were of unusual interest.

Reports on the current status of distributors' sales showed that business has not been too brisk but promises improvement.

Lincoln Welding Foundation Offers Annual Scholarships

CLEVELAND — Seventy-seven awards and seven scholarships, totalling $6,750, are offered to undergraduate engineering students in the annual program of the James F. Lincoln Arc Welding Foundation.

Students' papers, which must be postmarked not later than midnight, May 15, 1948, are to deal with design for arc welding of parts of machines, complete machines, trusses, girders, structural parts or their maintenance.

Orders Drop Off In Brass Plants

WATERBURY, CONN.—The brass industry is hopefully looking to the future but is still suffering from the effects of the steel shortage and cutback production due to lack of orders.

Part of the slump was held seasonal.

Figures indicate some gain in brass plants from the summer decline which saw operations in several concerns cut from 40 hours to 32 weekly to avert layoffs.

Rodney Chase, industrial relations director for Chase Brass and Copper Co., reported that the sheet and rod mills have been on the 32-hour schedule for some time but three times in the past month operations were carried on for five days but not for 40 hours.

The American Brass Co., with plants in the Naugatuck Valley, New York state, Ohio and Canada, reported that it expects little change in operations.

"For some weeks," John A. Coe, Jr., executive vice-president said, "there has been little change in our business with respect to incoming orders and production. Some customers have found it necessary to hold up shipments of our products because of inability to obtain supplies of materials from other industries. It is anticipated that there will be some relief in this respect in the not-distant future but this will not to any degree affect rate of operations. It is not unusual for mill working schedules to be at a lower rate during the summer months, and it is possible that the fall and winter months will bring some improvement in demands, although there is nothing to indicate heavy requirements.

"No serious difficulties are presently being experienced in obtaining the supplies need for operation of facilities," Mr. Coe concluded.

Shortage of steel was blamed by William M. Goss, executive vice-president of Scovill Mfg. Co. for low brass goods production and he reported that hopes for early recovery have been definitely retarded. Industrial prosperity hinges on steel, Mr. Goss declared, and until steel is available to manufacturers in quantity and at reasonable prices, brass and other industries cannot return to the peak production of the months during reconversion from wartime schedules.

Scovill had held hopes for an early recovery in the brass industry. Mr. Goss noted, however, that sales department reports indicated that duplication of orders and backlogs have disappeared.

Slashes Expected In Steel Quotas

PITTSBURGH—In a move calculated to relieve some of the headaches of a large carryover at the end of December, steel companies are expected to slash fourth-quarter quotas more severely than had been anticipated.

Large carryovers from the third quarter were aggravated by the recent railroad strike here.

This is entirely apart from the backlog situation which remains indefinite in size but which is potentially as bulky as at any previous date in 1947. In other words—there is no lessening in demand for steel.

Proposed emergency and follow-up freight rate increases, if granted, have long-term potentialities. Warehouse buyers of steel will suffer immediately in any event of a raise, and delivered prices of mill steel also will be higher to the consumer. Steel mills will be affected later when they start to pay more freight on the items they buy. Thus, an advance in steel prices might not be a subject of immediate consideration.

Production of steel during the winter months, including the fourth quarter, is uncertain to the extent that some blast furnaces must undergo repairs.

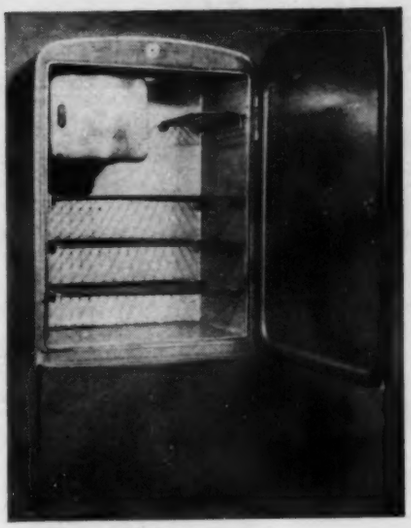
Fortunately, the mills in the Pittsburgh district get most of their coal by barge and complaints of a coal car shortage in steel mill circles are few.

Bookings of steel in most of the major classifications of products are in excess of shipments. Some steel consumers, after fighting the steel scarcity for a period of months, are finally giving more serious consideration to substitute materials.

Light flat-rolled stainless is now quickly available. In hot and cold rolled sheets of carbon grade order arrearages are as heavy as any time since the end of the war.

Carbon bar business is not quite as heavy as a few months ago but there is still a good backlog and mills will cut allocations of raw steel in this direction if demand continues to drop. Cold-finished bars are easy and have led to lower requirements of hot bars.

The plate market is unfavorable to the buyer. Fabricators in shapes have large commitments. First indications of pipe allotments for 1948 are that they will be about the same as this year. As a whole the steel situation is anything but favorable to the manufacturer.



In An Attempt To Make a Manufacturing Comeback, a French nationalized aircraft factory is preparing to produce this all-aluminum refrigerator. It stands 4.7 ft. high and contains six cubic feet, weighing only 215 pounds. — McGraw-Hill World News

Stamping Firms Cut Operations

CLEVELAND—Shortage of steel has caused curtailment of production in some of Cleveland's stamping plants but the majority of metalwerking concerns in this area have managed to keep operating with a full complement of men.

One of the largest stampers worked two shifts until recent weeks. Now operations are on a one-shift basis and with part of that time being switched to processing electric steel —furnished by the customer—because of the lack of 20 to 24 gage cold drawn sheets.

Another plant in this area has been forced to turn to other products when steel of desired specification was not available and which has slowed down production considerably.

A third plant is now faced with the necessity of reducing the work week for even one shift.

The management of one of these companies is not entirely satisfied with blaming the shortage of steel, citing the fact that stampers are processing more steel than ever before in their history.

A supply of over-priced steel has appeared again on the market. Metalworking companies are now being approached almost daily with offerings of sheet and strip two to three times the mill card price.

One sizable metalworking plant using a large tonnage of steel when in full operation has been forced to reduce its operations to every-other-week basis within the past month, primarily because its source of supply has been able to furnish only a quarter of the tonnage required.

Steel Shifts Tactics on Growth

WASHINGTON — Leaders of the steel industry are now emphasizing the business difficulties standing in the way of expansion instead of insisting that there is no need for greater steel capacity.

This shift in ground has generated some belief that the industry might welcome unofficially some government help in effecting a major expansion of production capacity.

Henry Kaiser's proposal last month that the government permit steel companies to take a tax deduction each year of 20% of the cost of new facilities—similar to the five-year amortization permitted during the war on munitions plants. This has aroused a lot of interest in the industry. It might be the form government help could take.

Steel men have been disturbed about amortization in general, lately. Their worry is that amortization they can now take for tax purposes is based on the original cost of their present facilities. Since replacement would now cost a lot more than the original outlay, they are unable to build up adequate reserves for ultimate replacement.

U.S. Steel this year, in its half-year report, charged a large item of extra depreciation against profits for internal bookkeeping even though they were unable to deduct it in computing taxes.

Bearing Plants Fined On Conspiracy Charge

CLEVELAND — Six ball bearing manufacturers, pleading nolo contendre to indictments charging conspiracy to fix and maintain prices in restraint of trade, were each fined $5,000 in District Federal Court.

Firms fined were: General Motors Corp., Detroit; SKF Industries, Inc., Philadelphia; Marlin-Rockwell Corp., Jamestown, N. Y.; Fafnir Bearing Co., New Britain, Conn.; Federal Bearing Co., Inc., Poughkeepsie, N. Y.; and Norma-Hoffman Bearing Co., Stamford, Conn.

Charges against Fred G. Hughes, general manager of the New Departure, division of General Motors, were dismissed and suspended fines of $5,000 each were ordered for Howard Johnston, sales manager for Marlin-Rockwell, and Charles F. Stanley, vice president and sales manager of Fafnir.

Names in the News

George E. Hallenbeck

A. L. Baker

Herbert L. Tigges

George E. Hallenbeck, president of Baker Brothers, Inc., Toledo, Ohio, since 1939, has been elevated to the position of chairman of the board. He has been succeeded as president by **A. L. Baker,** former vice president and general manager, who also retains the latter title. **Herbert L. Tigges,** former vice president in charge of sales, has been elected executive vice president. **M. E. Fischer,** superintendent, has been elected vice president in charge of manufacturing, while **Thomas L. Hallenbeck,** research engineer, is now vice president and director of engineering.

Meade Johnson, former marketing manager of the Stamford Div., The Yale & Towne Manufacturing Co., has been named general sales manager. **A. Douglas Dalton** has been promoted from general superintendent to assistant general manager, while **Harold E. Nagle,** former superintendent of methods, replaces Mr. Dalton.

William E. Butts, vice president of General Metals Corp., has been elected president of Enterprise Engine & Foundry Co., San Francisco.

Herbert W. Smith has been appointed direct European representative for The National Acme Co., Cleveland, with headquarters in Birmingham, England.

Charles S. Dennison has been appointed sales manager of Willys Overland Export Corp.

Robert W. Brandt has succeeded **George A. Sloan** as sales representative for Corbin Screw Div., The American Hardware Corp., New Britain, Conn., in the South Atlantic states.

H. R. Russell has been appointed general sales manager of Tinnerman Products, Inc., Cleveland. For the past six years, Mr. Russell has served as vice president and general sales manager of the Commercial Controls Corp., Rochester, N. Y.

BUSINESS ITEMS

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., has formed a subsidiary company, **Honeywell A. G.,** with headquarters in Zurich, Switzerland. The subsidiary will handle the company's complete line as well as that of another subsidiary, **The Brown Instrument Co. Charles B. Meech** has been transferred to Zurich as manager.

Nash-Kelvinator Corp., Detroit, has formed a **Plastics Div.** to manufacture plastics production machinery and parts. **W. F. Poupard** is in charge of the recently converted plant in Milwaukee which houses the new division.

Dearborn Motors Corp., Detroit, has purchased **Wood Brothers, Inc.,** farm equipment manufacturing firm in Des Moines, Iowa. **Frank B.** Pierce, president of Dearborn, succeeds **W. Harold Brenton** as president of Wood Bros. **Neil T. Chadderdon** will continue as vice president and general manager in Des Moines.

The American Machine & Foundry Co. has moved the offices for its Bakery Machines and Ovens, Lowerator Dispensers, Wahlstrom Tools, Rose Candy Machinery, Tobacco Machinery, and International Divisions to 485 Fifth Ave., New York. Executive offices will remain at 511 Fifth Ave.

The Whiton Machine Co., New London, Conn., has appointed the **R. E. Ellis Engineering Co.,** Chicago, as its exclusive representative in that area for Whiton lathe chucks, centering machines and gear cutting machines.

The Keller Tool Co., Grand Haven, Mich., has opened a Los Angeles branch office at 507 W. Washington Blvd. **W. A. Nilsson** is branch manager.

MEETINGS

American Gear Manufacturers Association. Fall meeting. Edgewater Beach Hotel, Chicago. Oct. 27-29. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22.

American Society for Metals. National Metal Congress & Exposition. International Amphitheatre, Chicago. Oct. 18-24. Graves Taylor, 7301 Euclid Ave., Cleveland 3.

American Society of Body Engineers. Annual convention. Rackham Memorial Building, Detroit, Nov. 5-7. A. H. Haberstump, chairman publicity committee, 100 Farnsworth Ave., Detroit 2.

American Society of Mechanical Engineers. Annal meeting. Atlantic City, N. J. Dec. 1-5. Ernest Hartford. executive assistant secretary, 29 West 39 St., New York.

American Society of Tool Engineers. Semi-annual convention. Statler Hotel, Boston, Oct. 30-Nov. 1. J. Cannon, director of public relations, 1666 Penobscot Bldg., Detroit 2.

American Welding Society. Annual meeting. Hotel Sherman, Chicago. Oct. 19-24. M. M. Kelly, secretary, 33 W. 39 St., New York.

Industrial Management Society. 11th National Time and Motion Study Clinic. Sheraton Hotel, Chicago. Nov. 5-7. Ralph M. Landes, chairman, 176 West Adams St., Chicago 3.

National Conference on Industrial Hydraulics. Hotel Continental, Chicago. Oct. 16-17. S. Charles Pappageorge, 33 West 33 St., Chicago 16.

National Tool and Die Manufacturers Association. Annual meeting. Benjamin Franklin Hotel, Philadelphia, Pa. Nov. 2-5. George Eaton, executive secretary, 1412 Union Commerce Bldg., Cleveland 14.

Society for Experimental Stress Analysis. Annual meeting. Hotel Pennsylvania, New York, Dec. 4-6. W. M. Murray, secretary-treasurer, Central Square Station, Cambridge 39, Mass.

Take a Tip . . . FROM THIS TAP

Users of Threadwell COLD-TEMPER Taps know that they're getting more for their money

- more holes per tap because Threadwell's deep-freeze treatment at 120° below zero gives extra hardness with no loss of ductility and *polished flutes* mean reduced chip clogging and breakage
- more convenience in use because Threadwell Taps are *i-dot-ified*, greaseless rust-proofed, tap-capsuled* in transparent plastic tubes to protect ground threads and permit selection without unwrapping.

**Red* dot on the shank for cut thread, *white* dot for commercial ground, *blue* dot for precision ground.

***Threadwell* TOOL SETS have the same quality and convenience that have made Threadwell Taps such an outstanding value.**

Threadwell Screwplates are designed for maximum utility. They assure quick, clean, straight, accurate threading for every shop purpose.

Threadwell Counterbore Sets give you the sizes you want for fillister screw counterboring or spot facing. Threadwell High Speed Counterbores cut like a drill, without chatter. Two cutting lips with spiral flutes for ample clearance and strength, easy sharpening.

Threadwell Keyway Cutter Sets give you the fastest, simplest, lowest cost means of cutting keyways to standard width and any desired depth. The Threadwell Arbor Press is ideal for use with the Keyway Cutters and for many other purposes around the shop.

Write for Bulletins

Delivery on standard items now being made from stock

SOLD EXCLUSIVELY BY MILL SUPPLY DISTRIBUTORS THROUGHOUT THE UNITED STATES AND THE WORLD

Threadwell
"TOOLS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY GREENFIELD, MASSACHUSETTS, U. S. A.

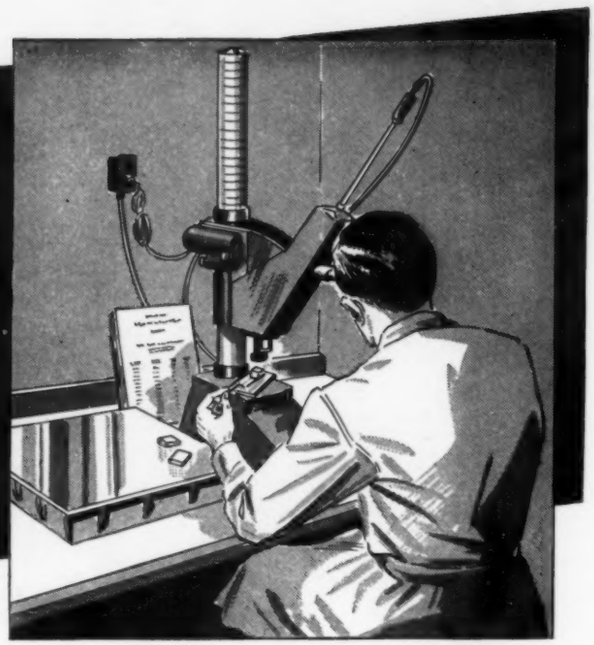
CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

GAGE BLOCK INSPECTION SERVICE

$15.00

84 BLOCK SET

(Other sets proportionately low)



DON'T LET DOUBT CAUSE CONTROVERSY
. . . IT COSTS SO LITTLE TO BE SURE!

Webber opens its inspection facilities to all users of gage blocks regardless of make. The wear inflicted through daily use over a period of months is sufficiently great to warrant careful examination at periodic intervals. The absence of this precaution can cause controversy and production difficulties. Avoid trouble, send those gage blocks to Webber, now.

WEBBER GAGE COMPANY
A 1631
Certificate of Inspection
Date November 25, 1946
PROPERTY OF
John Doe Company
Anywhere, U.S.A.
Webber Gage Company

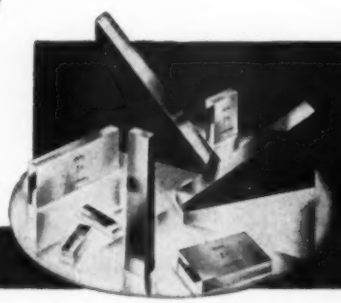
YOUR CERTIFICATE OF ACCURACY

1. ***We will return the gage blocks with a Certificate of Inspection showing present size in comparison with master blocks CERTIFIED by the U. S. Bureau of Standards.***
2. ***Removal of burrs and nicks which impair accuracy.***
3. ***Identification of those blocks beyond repair—along with a recommendation for replacement.***

Webber Gage Co. • 12901 Triskett Rd. • Cleveland 11, Ohio

WEBBER MAKES PRECISION GAGE BLOCKS EXCLUSIVELY

- ★ Gage Block Sets in Steps of .00005".
- ★ Individual Special Size Blocks.
- ★ Heavy Duty Gage Blocks.
- ★ Angle Gage Blocks in Steps of one second.
- ★ Carblox (Carbide) Wear Gages.



Webber
PRECISION GAGE BLOCKS

American Machinist REFERENCE BOOK SHEET

Checking Squares and Angle Plates

BY E. J. RYCHLIK

WHILE TOOLMAKERS are always concerned with using accurate angle plates and squares, most of them seem to think that a master square is necessary to check any inaccuracies. Actually, the error in both a square and an angle plate can be obtained from two readings taken with a dial indicator and height gage, when the square and angle plate are clamped together in the two positions shown in Figs. 1 and 2.

The indicator should be set at zero at the outside edge of the square. The reading obtained as the indicator is moved toward the face of the angle plate should be given a plus or minus sign, depending on whether the edge of the square slopes up or down. In Fig. 1, for example, the reading would be plus; in Fig. 2 it would be minus. The formulas which gives the errors are:

$$\text{Error in angle plate} = \frac{A + B}{2}$$

$$\text{error in square} = \frac{A - B}{2}$$

The sign which is obtained in the answer indicates whether the angle X shown in the square or angle plate is greater or less than 90°. A plus sign indicates an angle greater than 90°; minus sign indicates an angle less than 90°.

Two examples will show how the method is applied.

EXAMPLE 1:

Reading $A = 0.003$ Reading $B = 0.009$

$$\text{error in angle plate} = \frac{0.003 + (-0.009)}{2} = \frac{-0.006}{2} = -0.003 \text{ (angle is less than 90°)}$$

$$\text{error in square} = \frac{0.003 - (-0.009)}{2} = \frac{0.012}{2} = 0.006 \text{ (angle is greater than 90°)}$$

EXAMPLE 2:

Reading $A = -0.002$ Reading $B = 0.002$

$$\text{error in angle plate} = \frac{-0.002 + 0.002}{2} = \frac{0.000}{2} = 0.000 \text{ (no error, angle is exactly 90°)}$$

$$\text{error in square} = \frac{-0.002 - 0.002}{2} = \frac{-0.004}{2} = -0.002 \text{ (angle is less than 90°)}$$

The erorr so obtained represents the error in a certain number of inches, depending on the length of the square used.

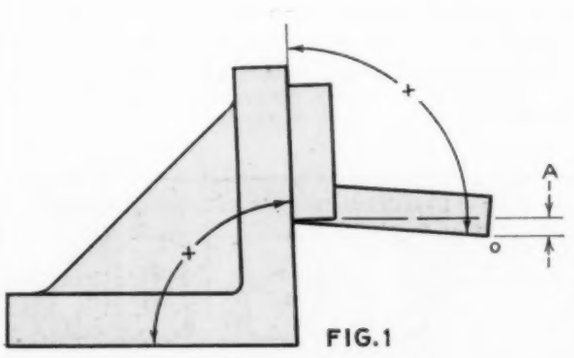


FIG. 1

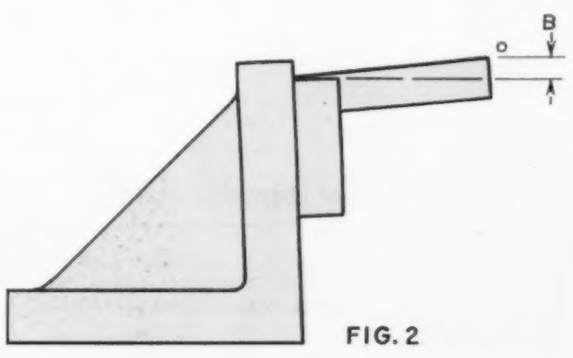
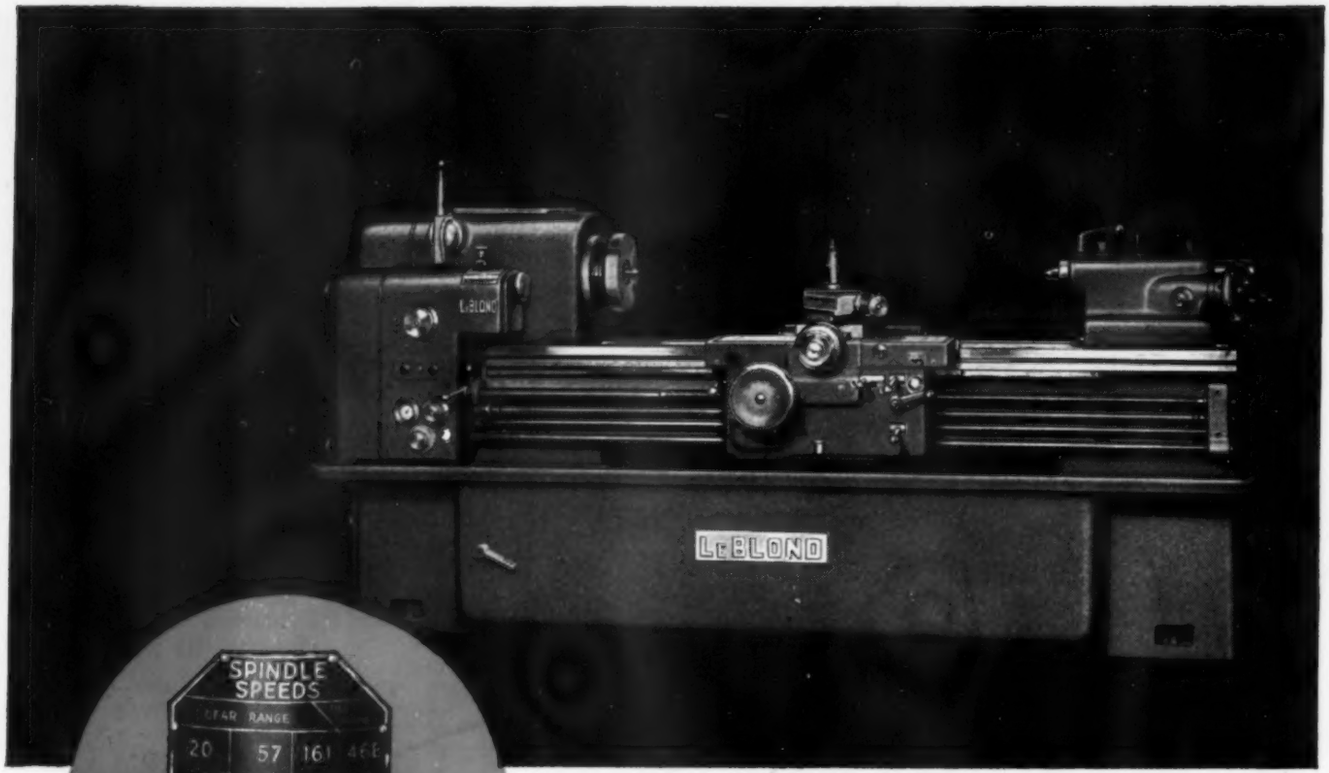
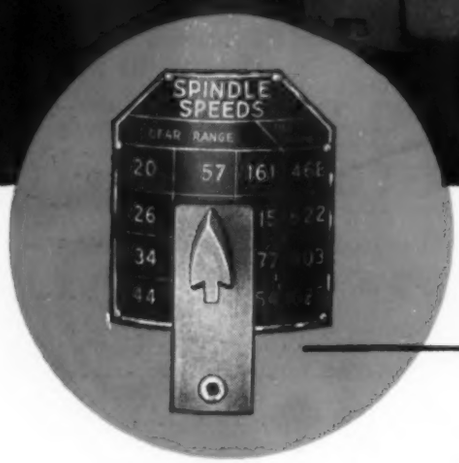


FIG. 2





One lever controls 16 spindle speeds

IN THE NEW LeBLOND 16" MODEL RT HEAVY DUTY LATHE

MODEL RT STANDARD FEATURES:

- Single lever controls 16 spindle speeds ranging from 20 to 1025 rpm, or 30 to 1537 rpm.
- Combination gear-belt drive headstock
- All main drive gears hardened and ground
- Universal power rapid traverse moves carriage, cross slide, and tailstock
- Feed box totally enclosed, automatically lubricated
- Flame hardened and ground steel bed ways front and rear
- One-piece apron with single lever control and positive jaw feed clutch; automatic lubrication
- Thrust-lock tailstock with worm and rack construction; full length bearing for spindle; direct reading spindle travel dial
- Deep steel chip pan, automatic length stops, tool storage lockers, and many other features.

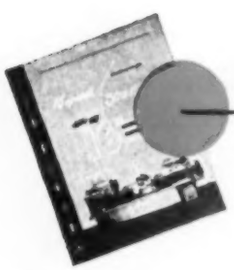
Built to meet the metal working industry's need for increased productivity of both man and machine, LeBlond's new Model RT actively aids and encourages operators to produce more and better work. It has everything: speed, power, accuracy, versatility. Your operators will like it because it's so easy to run and maintain. You'll like it because it will perform profitably so many different kinds of work: production, tool room, experimental, maintenance.

Be sure to investigate the Model RT. There's no comparable lathe on the market today. Send for descriptive bulletin HD-30A.

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

New York 6, Singer Bldg., 149 Broadway, COrtlandt 7-6621-2-3.
Chicago 6, 20 N. Wacker Drive, STA 5561.
Philadelphia 40, 3701 N. Broad Street, SAgamore 2-5900.



Get your free copy

of new illustrated bulletin HD-30A describing LeBlond's 16" Model RT Heavy Duty Lathe. Write Dept. RT-20.

LeBLOND

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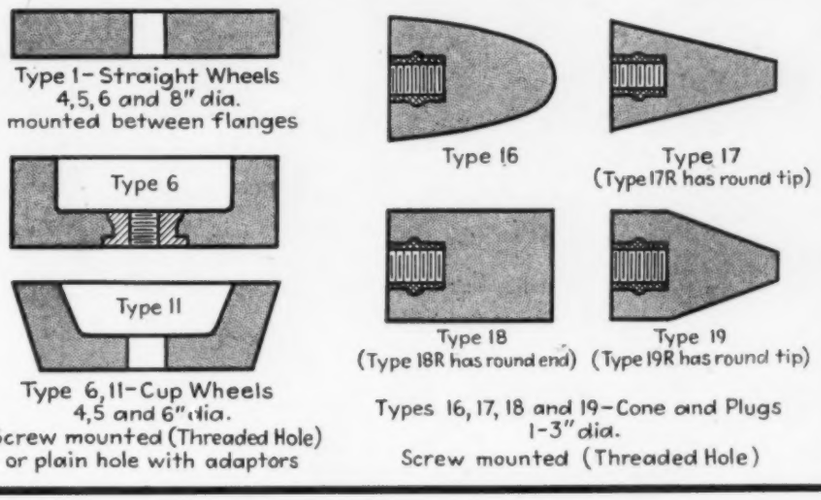
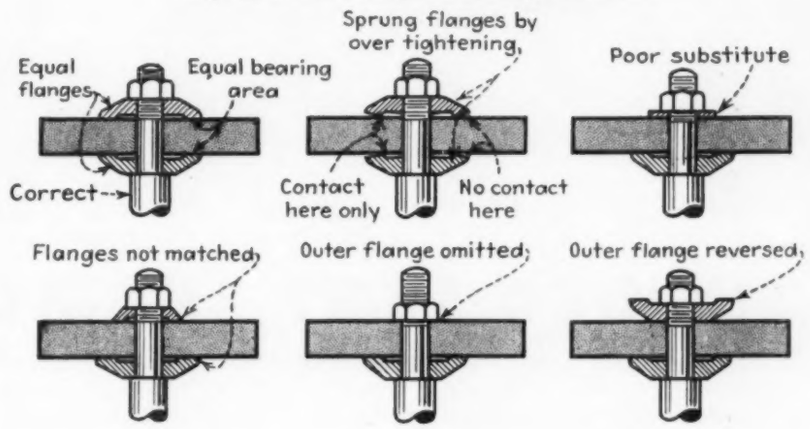
Safe Use of Portable Grinders — I

COURTESY GRINDING WHEEL MANUFACTURERS ASSOCIATION

Grinding Wheels Commonly Used With Portable Grinders


Type 1 – Straight Wheels
4, 5, 6 and 8" dia.
mounted between flanges
Type 6
Type 11
Type 6, 11 – Cup Wheels
4, 5 and 6" dia.
Screw mounted (Threaded Hole)
or plain hole with adaptors
Type 16
Type 17
(Type 17R has round tip)
Type 18
(Type 18R has round end)
Type 19
(Type 19R has round tip)
Types 16, 17, 18 and 19 – Cone and Plugs
1-3" dia.
Screw mounted (Threaded Hole)

Improper Mounting Of Straight Wheels



CAUSES of wheel breakages on portable grinders are: improper mounting of the wheel; improper speeds; abusive operation, and careless handling.

Investigations of breakages in the plants of users have revealed the illustrated conditions of improper mounting.

Improper Speeds—Two types of portable grinders are: the slow-speed type which operates up to 6500 sfpm., on which vitrified wheels may be properly used, and the high-speed type, which operates up to 9500 sfpm., and which requires the use of high-speed organic-bonded wheels. Recognition of this difference is particularly important in plants where both types of machines are employed. Both types of wheels are plainly marked with the safe operating speeds in rpm.

No attempt should be made to convert a low-speed machine into a high-speed machine without advice from the manufacturer.

Lack of control or improper adjustment of speeds, particularly with air grinders, results in considerable trouble. In the case of air-driven grinders, this may be caused by the speed governor getting out of adjustment or not functioning. Remember that the pressure at the compressor may be misleading. The pressure at the tool is more important and may be quite different due to line loss and restrictions.

In the case of high-cycle electric machines, the delivered voltage should be checked periodically.

Wheels can be broken by lack of adequate power. If a wheel slows down materially when applied to the work with normal pressure, it is an indication that sufficient power is not being transmitted to the wheel spindle.

The slowing down of the wheel due to inadequate power is likely to cause the wheel to develop "flat spots," leading the operator to believe that the wheel has hard and soft spots. The bumping action resulting from the flat spots may ultimately cause wheel breakage.

Abusive Operation — Grinding on the flat sides of straight wheels is often hazardous and should not be allowed when the sides of the wheel ars appreciably worn thereby or when any considerable or sudden pressure is brought to bear against the sides. Care must be used when using a portable grinding machine for cleaning out grooves or between projections. A "cramping" action on a straight wheel is dangerous and a cause of breakages.

As maximum wheel life is always desirable, there is a tendency to request harder and still harder wheels. If a wheel is too hard for the work being done, the operator is likely to use excessive pressure, which sets up dangerous stresses in the wheel.

Safety Code Requirements—The ASA "Safety Code for the Use, Care and Protection of Abrasive Wheels" states:

"All abrasive wheels shall be provided with one of the following forms of protection, specifications

Cutting Out the "Chatter" Improves Quality

SUNOCO WAY LUBRICANT...

Increases Accuracy, Eliminates Need for Extra Grinding

A manufacturer of steel products was having trouble with the lubrication of five milling machines. The tableways and cross-slide ways were becoming coated with heavy, dark brown deposits which caused severe chattering. An extra grinding operation had to be specified, and many pieces were rejected because of the quality of the machining.

An outstanding performer, Sunoco Way Lubricant, was recommended by the Sun Engineer who was called in for consultation. With this lubricant in use, table chatter was completely eliminated. Better tolerances were obtained. The additional grinding step was no longer necessary.

Quality of the dies that are being milled has been much improved, and the management now states it would not use any other lubricant on these machines.

Increased production and improved quality are typical results in plants where Sun "Job Proved" lubricants are used. In machine shops, in power plants, in quarries, mines, mills and factories, Sun "Job Proved" lubricants help to "produce more for less." For full information on the Sun lubricants for your machines, call the nearest Sun office, or write Department AM-10

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
In Canada: Sun Oil Company, Ltd. — Toronto and Montreal

SUN
SUNOCO
INDUSTRIAL PRODUCTS

Safe Use of Portable Grinders — II

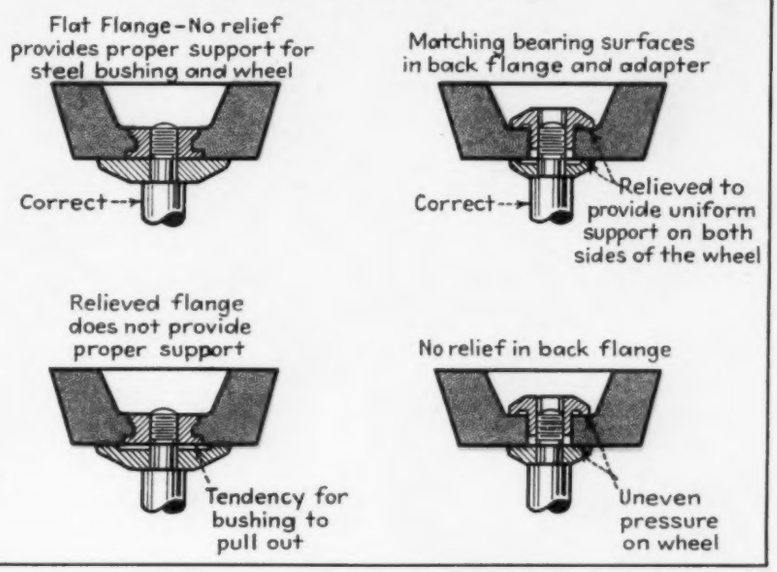
for which appear elsewhere in this code." (a) Protection Hoods; (b) Protection Flanges; and (c) Protection Chucks.

Because of the small size of the wheels used on portable grinders, protection flanges are not practical and protection chucks are not applicable.

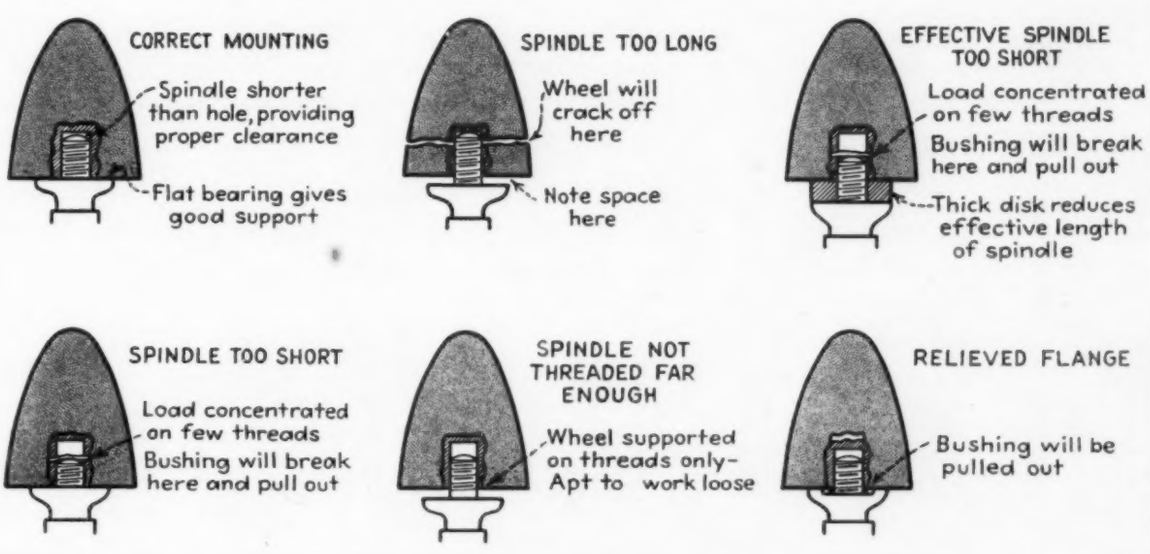
Some plants have used a "Revolving Cup Guard," which replaces the fixed flange on the machine. It should therefore be keyed or otherwise secured to the shaft. The wheel is held by a flanged adaptor or by a conventional flange and nut. Revolving cup guards are not effective when used with a threaded hole wheel, because if the wheel should break there is nothing to hold the pieces in the guard. Revolving guards should not be used with cup wheels larger than 8 in. in diameter, nor where the peripheral speed exceeds 9,500 sfpm.

Safety washers, consisting of a thin layer of resilient rubber vulcanized to a thin metal disk, are not recognized in the ASA Safety Code as an independent protection device. However, if properly applied, they can be used as a valuable auxiliary protection, where it is difficult to use a hood with as complete protection as might be desired. Effectiveness of these safety washers is dependent on proper application. The rubber side must be in direct contact with the abrasive surface. For this reason all orders for wheels which are to be mounted between these safety washers should specify that "blotters" be omitted.

Improper Mounting Of Cup Wheels


Flat Flange–No relief provides proper support for steel bushing and wheel
Correct
Matching bearing surfaces in back flange and adapter
Correct
Relieved to provide uniform support on both sides of the wheel
Relieved flange does not provide proper support
Tendency for bushing to pull out
No relief in back flange
Uneven pressure on wheel

Improper Mounting Of Cones And Plugs


CORRECT MOUNTING
Spindle shorter than hole, providing proper clearance
Flat bearing gives good support
SPINDLE TOO LONG
Wheel will crack off here
Note space here
EFFECTIVE SPINDLE TOO SHORT
Load concentrated on few threads
Bushing will break here and pull out
Thick disk reduces effective length of spindle
SPINDLE TOO SHORT
Load concentrated on few threads
Bushing will break here and pull out
SPINDLE NOT THREADED FAR ENOUGH
Wheel supported on threads only–Apt to work loose
RELIEVED FLANGE
Bushing will be pulled out

Made to stand the grind

SIMONDS ABRASIVE CO.

RESINOID BONDED GRINDING WHEELS *with* RED STREAK FLANGES

Red Streak Flanges are circular steel flanges or plates embedded into the sides of resinoid bonded wheels immediately adjacent to the hole and lining a portion of it. Permits easier mounting and less maintenance cost on grinding equipment.

Accurate center holes . . . protected by steel . . . better fit . . . less wear on mounting equipment . . . truer running . . . these exclusive features mean MORE PRODUCTION AT LESS COST with Simonds Abrasive Foundry and Billet Grinding Wheels.

Insist on Simonds Abrasive Wheels with Red Streak Flanges for *your* grinders. Call your Simonds Abrasive Distributor now.

SIMONDS ABRASIVE COMPANY
is a division of
SIMONDS SAW AND STEEL CO.
Fitchburg, Mass.
Saws, Machine Knives, Files

Other Divisions:

SIMONDS STEEL MILLS
Lockport, N.Y.
Special Steels

SIMONDS CANADA SAW CO. LTD.
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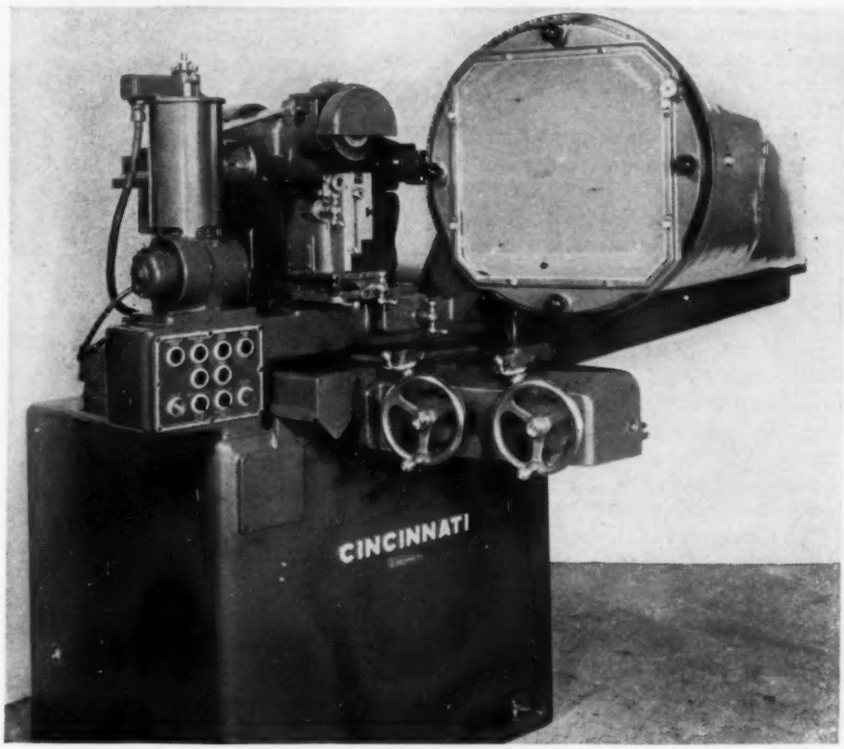
Simonds Products for Canada

SIMONDS ABRASIVE CO.
PHILADELPHIA, PA.

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA. • DISTRIBUTORS IN ALL PRINCIPAL CITIES

Shop Equipment News



An enlarged image of the work is compared with a master drawing during grinding on the Projecto-Form. Work remains stationary at all times during the grinding operation

Small Profile Shapes Ground On Cincinnati Projecto-Form

The Projecto-Form grinding machine for extremely accurate grinding of small profile shapes is announced by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. It provides an optically enlarged image of the work which can be compared with a previously prepared, enlarged master scale drawing.

A flood of parallel rays of light is focused across the top surface of the work onto an optical projection lens system, which throws a magnified silhouette image of the work profile on a ground-glass viewing screen. The screen image is not transposed or inverted. Standard magnification is 20:1, but a 40:1 ratio is available. The master drawing is mounted behind and in contact with the screen to permit comparison.

Vertical, longitudinal and transverse slides are used to position the work in relation to the optical system. A swivel movement of the platen provides for angular adjustment. The movements are accomplished by means of hand-positioning ballcranks.

The grinding wheelhead is carried on transverse and vertical slides to provide adjustment in relation to the work. Each slide is controlled by two handwheels, one for rough positioning and the other for fine adjustment. The wheelhead itself is mounted on a slide which provides longitudinal reciprocation of the wheel parallel to the optical axis of the projection system. Length of stroke is adjustable, and speed in each direction is infinitely variable. The slide in which the wheelhead reciprocates is mounted to permit angular adjustment of reciprocation in both horizontal and vertical planes. This provides a means for grinding end and side clearances of cutter teeth and punches without changing the position of the work in relation to the optical system.

Duro's Heavy-Duty Grinder Air Cooled by Propeller Fan

An improved heavy-duty grinder has been developed by Duro Metal Products Co., 2651 N. Kildare Ave., Chicago 39, Ill. Driven by a motor said to develop 42 watts output at approximately 20,000 rpm., it operates on 60-cycle (or less) ac. or dc. Working parts are air cooled by a propeller-type fan, and operation is said to be vibration free. The threaded-type collet chuck overhangs the housing by only 5/16 in. Two collets are provided: one for 3/32 in. shanks and the other for ⅛-in. shanks.

Model E Leadscrew Tapping Machine Made in Six Sizes by Cleveland

The Model E leadscrew tapping machine has been released by The Cleveland Tapping Machine Co., Hartville, Ohio. Designed for high-speed production tapping, it permits the use of multiple heads for tapping groups of holes, even of different pitch, with each stroke of the spindle. Adjustable heads can be used where hole patterns vary, and indexing tables, cross-slides and hopper feeds can be combined with the automatic cycling of the machine to provide full-automatic operation.

Both leadscrew and nut are located at the top of the spindle away from dirt and chips. They are accessible for removal by unscrewing two capscrews, and can be replaced for change of pitch in a few minutes. The tap is used only as a cutting tool and it is said that it cannot run away.

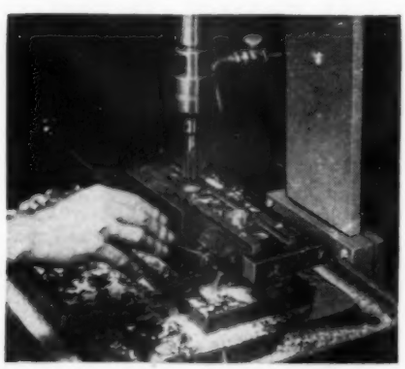
A new-type clutch is designed to release instantly if the tap becomes dull, encounters hard spots in the work or strikes chips in a blind hole.

A precision depth control is incorporated for safe blind-hole tapping. A marked dial operated from the quill pinion shaft raises or lowers the limit-switch contactor which controls length of stroke. The limit switch automatically reverses the high-reversal tapping motor within two revolutions, and it is said to control tapping depth to within 0.005 in.

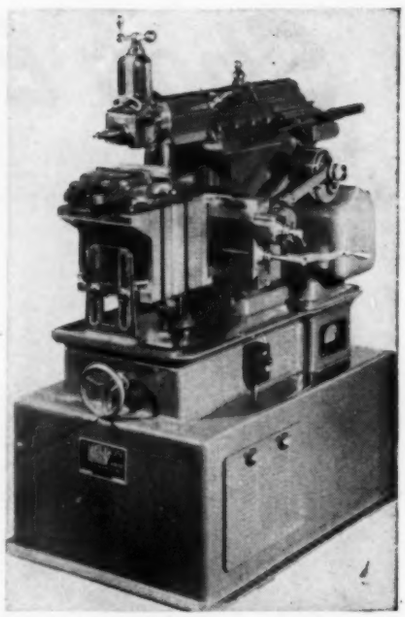
Operation is either manual or automatic. When manual, stroke of the tapping spindle is controlled either by pushbutton or footswitch. Rotation of the spindle in either manual or automatic operation can be stopped in any position by pushing a "stop" button. Rotation can be started in up or down movement, counterclockwise or clockwise, by pushing the "raise" or "lower" button. By turning the lever to automatic, the machine functions continuously, and the operator need only feed and remove work.

The machine is made in six sizes, covering a tapping range in mild steel from ¼- to 2¾-in. N.C. Models E1 and E2, the smaller models, have four spindle speeds through open belt drive. Model E3 has four speeds through 2½:1 back gears and multiple-step pulleys, and Model E4 has 3 speeds through 3¾:1 back gears and multiple-step pulleys. E3 and E4 can be equipped with quick-change gears (Models E3U and E4U respectively) providing either open-belt or back-geared drive, doubling the number of speeds and widening the range.

Model E1 shown equipped with an air-operated indexing fixture. With 12 places and 3-sec. tapping cycle, 900 parts per hr. can be produced. Machine stops if parts are not aligned



Hand-operated shuttle fixture used in simultaneously tapping two concentric holes. One side loaded and unloaded while other side is being tapped. Device is designed so that tap will not operate unless part is aligned



Sheldon 12-in. Backgeared Shaper Gives 12 to 180 Strokes per Min.

A 12-in. precision backgeared shaper has been designed to fill the gap between large industrial shapers and small bench-type machines. Made by Sheldon Machine Co., 4258 N. Knox Ave., Chicago 41, Ill., it follows the design of toolroom shapers.

A variable-speed motor provides all speeds from 12 to 180 strokes per min., and is adjusted by a handwheel. Automatic crossfeeds in both directions are from 0.0025 to 0.0175 in. A swivel table and swivel vise come as standard equipment. Controls are within easy reach of operating position. The unit incorporates heavy crossrail, large dovetails, and provides extra overhang of the ram.

Mechanical Loads Above Normal Sensed by Brinell Protectron

The Protectron, made by The Brinell Co., Granby, Conn., is an electronic device used with electric-motor-driven machines. It is set to trip at any preset mechanical load increase above normal. When it trips, a red warning light is illuminated and a relay is energized to initiate desired control function, such as stop motor, stop machine by clutch or brake, sound warning signal, or increase or decrease voltage on motor.

Said to be instantaneous in action, it is sensitive to minute overloads. Applications include: sensing oversize stock in feed machinery, tripping at preset degree of dullness of tools, and stopping pumps.

LODGE & SHIPLEY LATHES at work

Guarantee the precision . . . and performance so necessary in . . . Tool Room . . . work

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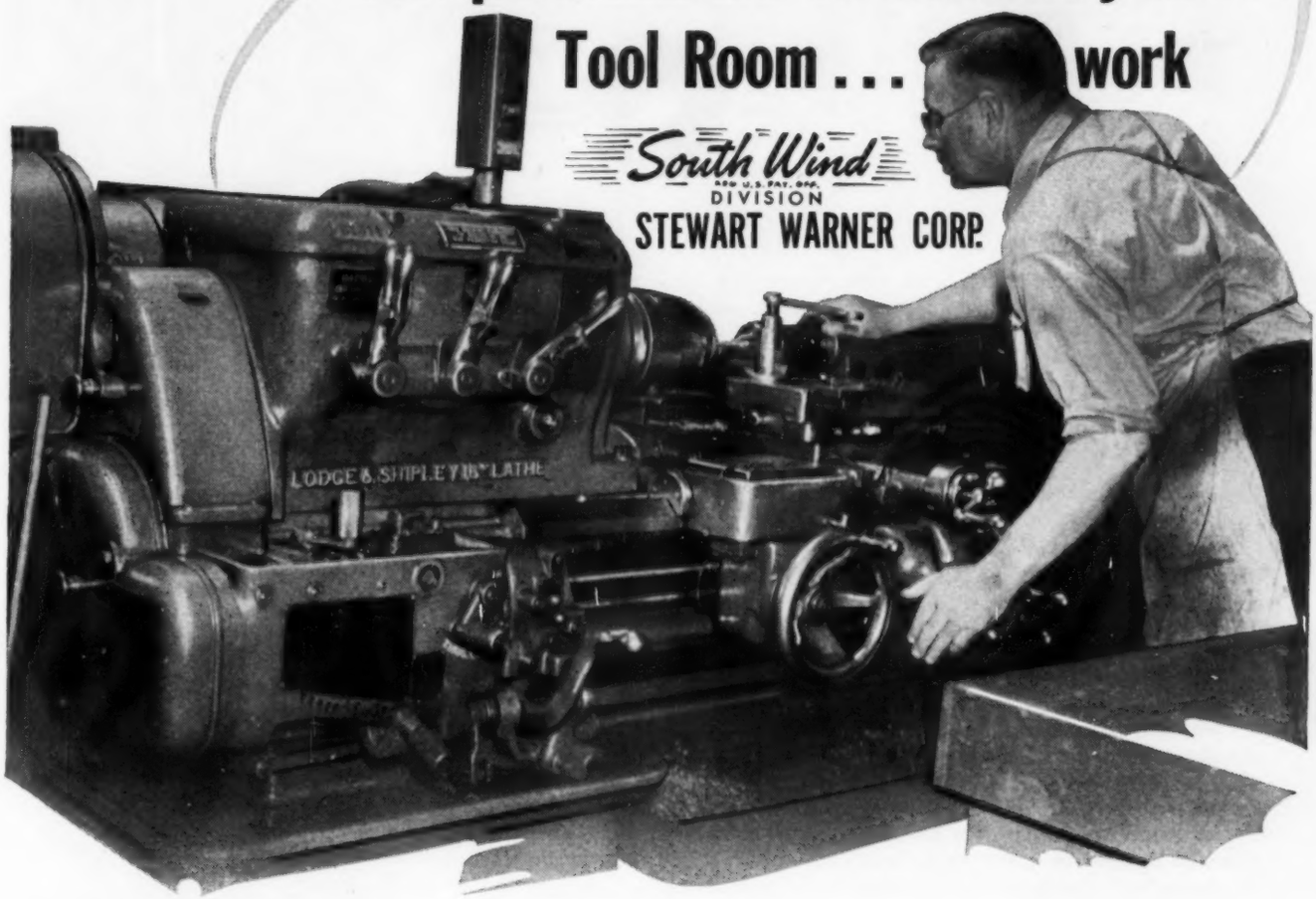
DIVISION
STEWART WARNER CORP.



● In the illustration, a die punch to be used in the production of famous "South Wind" gasoline-burning auto heaters is being machined on a 16″ Lodge & Shipley Tool-Room Lathe. This and other precision operations cause the owner to comment: "the foreman, as well as the operators, consider the Lodge & Shipley Lathe an excellent piece of equipment."

Forming tools, punches, screws and other precision parts are produced on Lodge & Shipley lathes in the South Wind plant. Operations including turning, boring, facing and threading are performed with carbide and high speed steel tools . . . hair-line finishing cuts can be made with extreme accuracy.

The chances are one of your industrial neighbors is an enthusiastic Lodge & Shipley user. Let our representative show you these fine lathes in action. Write for Condensed Catalog showing the complete line.

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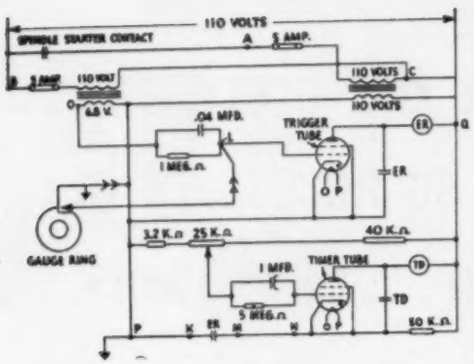


FIG. 2

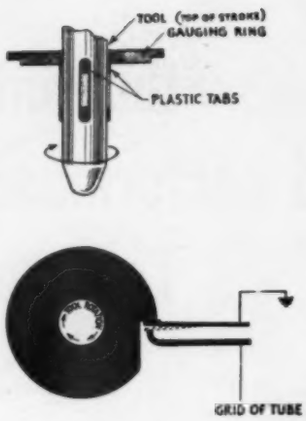


FIG. 1

Microsize control consists of three parts: gage ring, Micromold tool in which abrasive sticks are molded into plastic holders, and electrical control circuit

Electronic Automatic-Sizing Control On Micromatic Microhoning Machines

The Microsize electronic automatic-sizing control has been announced by Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 4, Mich. When a bore is honed to size, the device takes control of the Microhoning machine and directs it through proper sequence of operations to end the cycle.

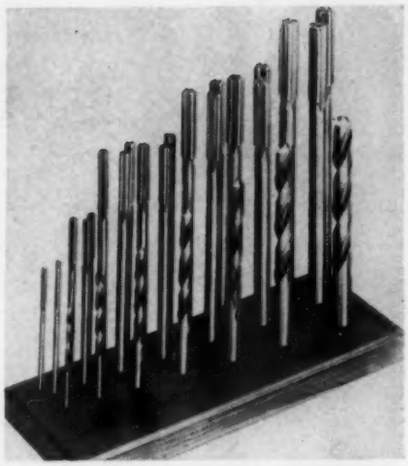
Two Thyratron electronic tubes are incorporated: the Trigger tube picks up "to size" impulse, and the Timer tube controls the runout period. It is said that bore-to-bore size can be held to 0.0003 in. or less in production. Combined with multiple-spindle machines equipped with automatic rotary-indexing fixtures, Microsizing makes it possible to Microhone progressively, removing stock in successive steps.

The gage ring (Fig. 1) contains a carbide insert having an inside diameter equal to the low limit of desired bore size. This ring is located so that only the plastic tab, on the upper end of each plastic stoneholder, can enter it at the top of each stroke. (Tabs wear with the abrasive, so that the outer diameter of the tabs, around the periphery of the tool, is always equal to the diameter of the bore being Microhoned.) When bore is "to size," friction between ring and tabs causes the gage ring to rotate slightly.

The electronic circuit serves as a link between the gage ring and relays. These relays actuate solenoids which shift spools in the hydraulic circuit of the honing machine to end the Microhoning cycle.

When the "to size" impulse rotates the gage ring, the grid (Fig. 2) of the Trigger tube is grounded. The tube fires, and relay ER is energized closing the ER contacts. One contact energizes a solenoid that shifts a spool to stop tool expansion. The other contact grounds the cathode of the Timer tube. After a delay (the runout period) the Timer tube fires and energizes a solenoid that shifts a spool causing collapse and withdrawal of tool from bore. Delay is controlled by magnitude of charge on the 1-Mfd. condenser.

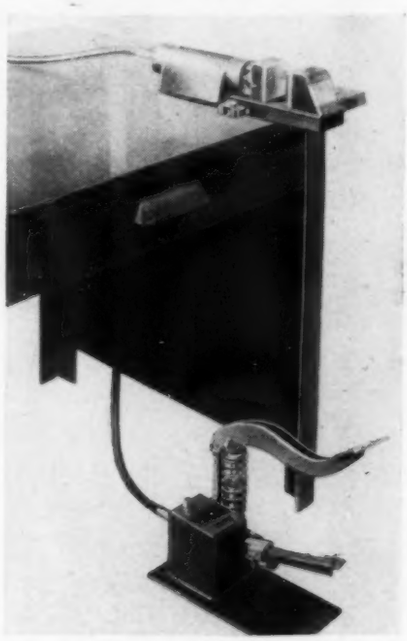
METAL-MELTING furnace, Model 1019, handles lead, tin, zinc, pot metal, type metal, aluminum and other metals. Equipped with nine burners, it has capacity of 1000 lb. of lead and delivers pot temperatures to 1400 F. Can be furnished with automatic temperature controls. Made by Johnson Gas Appliance Co., Cedar Rapids, Iowa



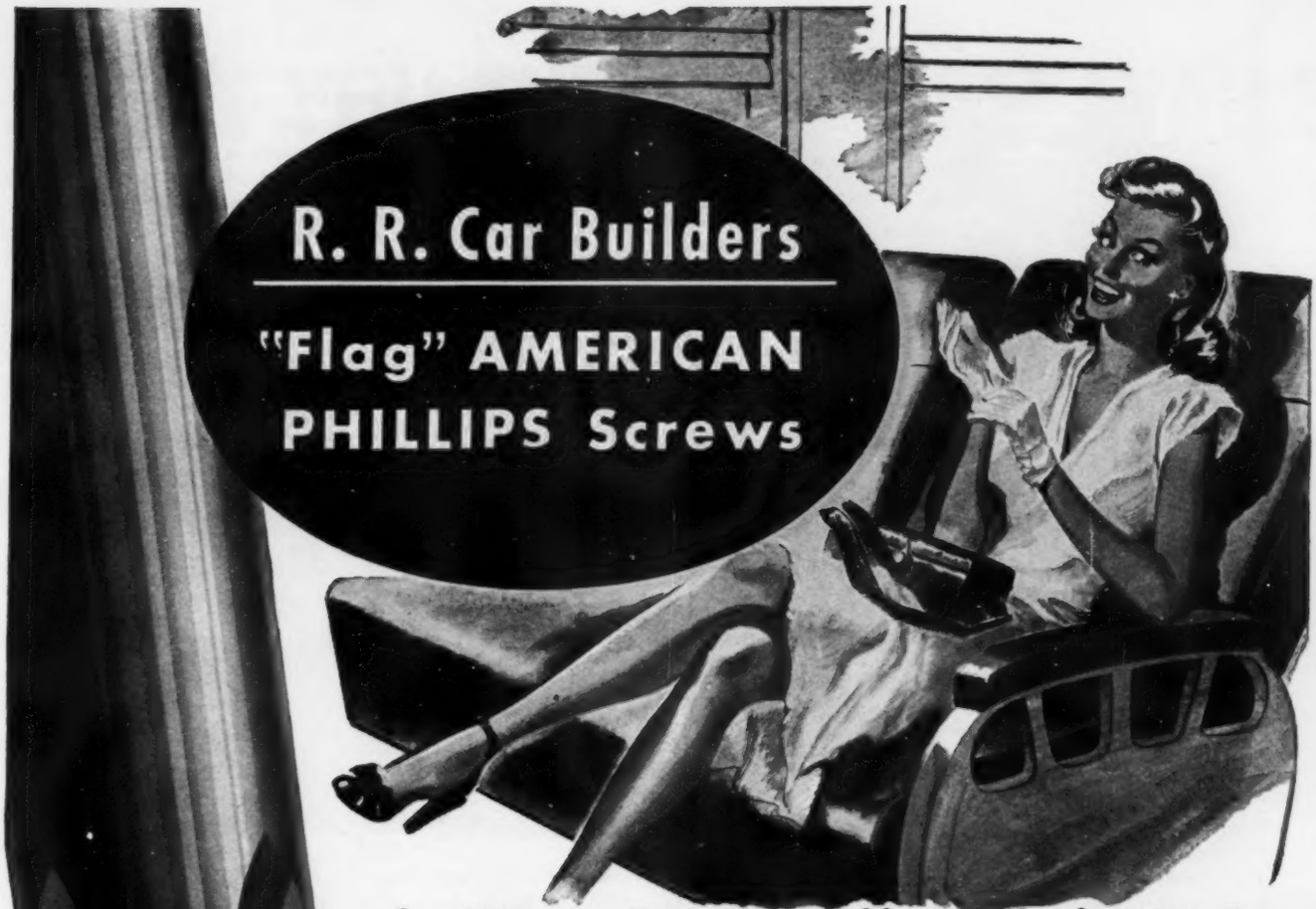
Supeream Decimal-Sized Reamers Furnished by Twentieth Century

Decimal-sized Supeream reamers from 0.0461 to 0.0501 are available from Twentieth Century Mfg. Co., 3726 Montrose Ave., Chicago 18, Ill., making a total of over 509 different sizes of stocked reamers in the line.

Diameters are held to plus 0.0002 and minus 0.000, and size markings are stamped half-way up the shanks. Each set has individual serial numbering. Flutes are ground on face and back after heat-treatment, which is said to prevent clogging or freezing of chips.



HYDRAULIC VISE has 2-ton capacity, is foot powered. One pedal tightens, the other pedal releases jaws. Designed for space and weight savings, it is 3 in. high, 15 in. long. Depth of jaws is 2 in.; max. jaw opening is 2½ in. Made by Munton Mfg. Co., Franklin Park, Ill.



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"HIGHBALL" PRODUCTION — "Highball's" the railroad term for *get moving*—and that's just what you do when fumble-proof, power-driven American Phillips Screws take over! Whether you make streamliners, appliances, radios or what not, American Phillips Screws can't slip off "the track" to harm work or worker—and there isn't a burred screw head in a carload. This *automatic,* speedy driving of engineered screws *ups* production schedules while gaining time-savings as high as 50%!

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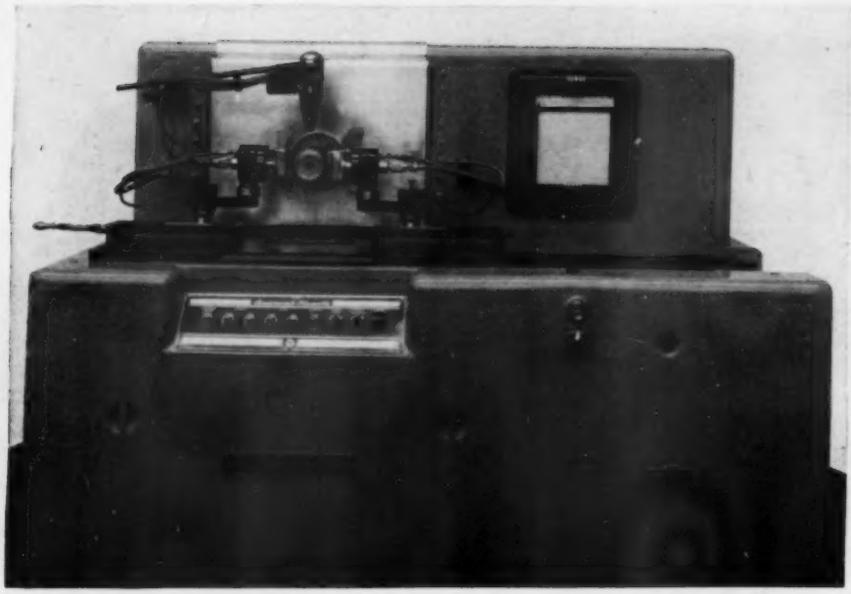
4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)



Operation is automatic except for loading of parts on the Flamatic

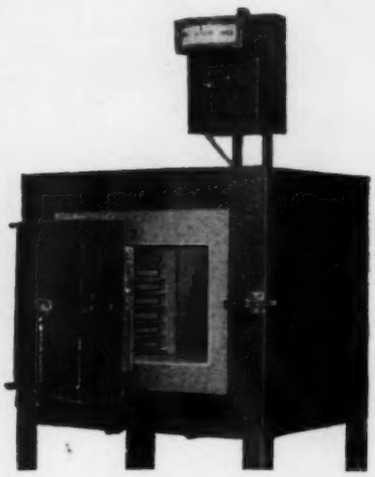
Production Surface Hardening On Cincinnati Flamatic Machine

The Flamatic hardening machine has been developed by The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, for surface hardening of parts in production quantities. It will be exhibited at the Metal Show. It incorporates an electronic control system which permits rapid heating of parts to desired preset temperature, followed by an oil quench. It is said that surface temperature at the instant the part enters the quench is held to ± 5 F. of desired value in the critical transformation range. Rapid heating would make it possible to confine heat to the surface of the part, leaving the core relatively cool with properties unchanged.

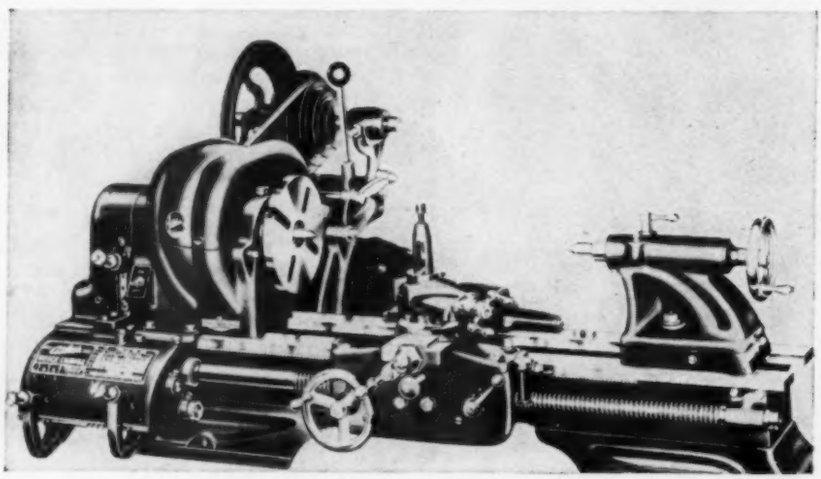
With standard flame heads, the unit handles parts that lend themselves to rotation such as gears, shafts, pinions and barrel-type cams. Special heads permit a wider range. The general capacity is shafts to 18 in. long, and parts with diameters to 8 in., with correspondingly shorter lengths.

The machine consists basically of worktable built over conveyorized quench tank, adjustable flame-head assemblies mounted on the table, and a spindle to which the work-holding device is attached, centered between the heads.

The operator places the work on the holding fixture and presses the automatic cycle-start button. The spindle starts rotating, flames are ignited, and the surface is heated to preset temperature. Then the flame is extinguished, the spindle stops and retracts, stripping the work off of the holding fixture and into the quench tank. The conveyor in the quench moves a preset distance at the beginning of each cycle to clear space for the next part.



HEAT-TREATING furnace, Lucifer Model DL 7052 electric, has automatic electronic control. One knob determines temperature. Range is to 2000 F., and rating is 6.5 kw. Unit has 12x12x10-in. muffle space, is regularly a floor model, can be bench model. Made by Gilbert S. Simonski, 407 N. Broad St., Philadelphia 8, Pa.



Atlas 10-in. Quick-Change Lathe Has 54 Threads and Feeds

A 10-in. quick-change lathe has been announced by Atlas Press Co., 2304 N. Pitcher St., Kalamazoo 13D, Mich. The quick-change mechanism provides fingertip selection of 54 threads and feeds, 45 of which are obtained by shifting two levers on the gear box, and an additional nine by changing the position of a sliding gear. A tumbler gear lever reverses gears or disengages them from the leadscrew. The gear train can be varied with change gears to provide many additional threads and feeds.

Swing over bed of the unit is 10¼ in. There are 16 spindle speeds from 28 to 2072 rpm. The thread-cutting range, right and left, is 4 to 240 per in. Two bed lengths are available with 24- and 36-in. capacity between centers. The lathe operates on a 1/3- or ½-hp. 1725-rpm. motor.

CAN YOU TURN A .005" WALL?

Could your present lathe turn and bore aluminum to hold a wall thickness of .005"?

One of our good customers ran into just such a production problem—and found the solution was to use a Monarch 10" EE Sensitive Precision Toolmakers' Lathe. *It was the only lathe they found that could hold such a tolerance.*

You may never run into a production job with these same exacting requirements—but if you use a toolroom lathe at all, you'll want the ability to turn within close limits on a production basis. That's why we believe you'll be interested in the Monarch Model EE Toolmakers' Lathe. May we give you more information? Ask for Bulletin 302, just off the press.

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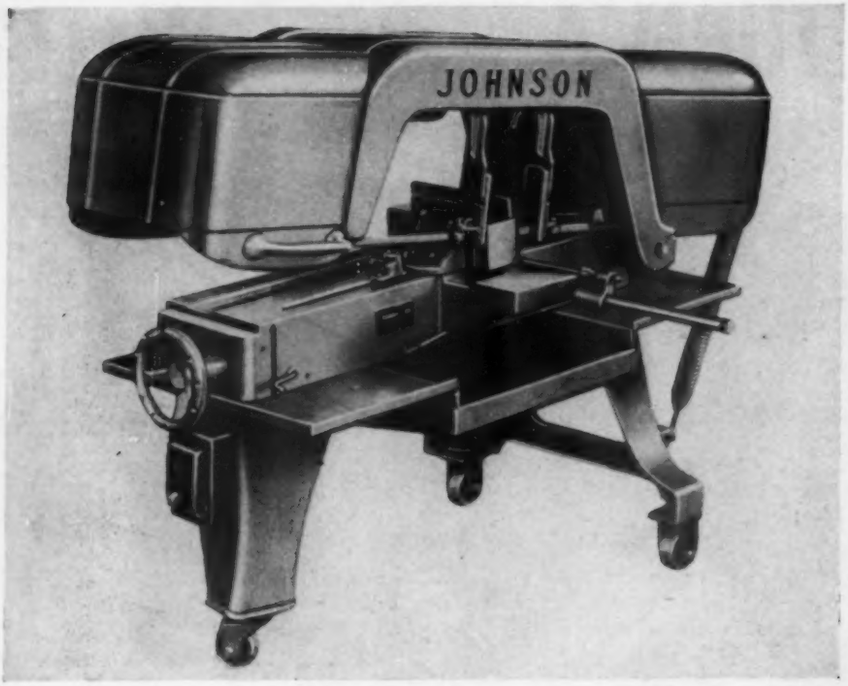
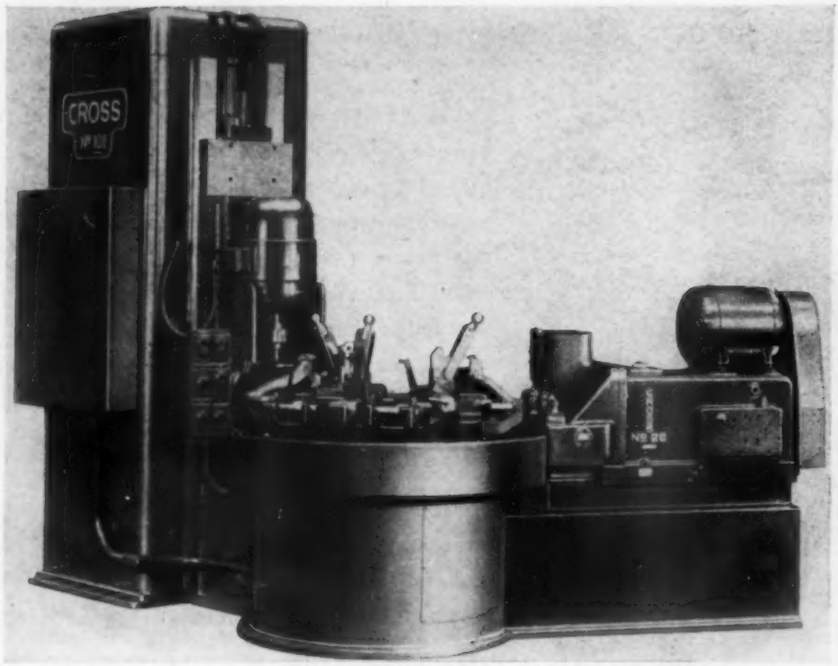
Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES

FOR A GOOD TURN *FASTER*—TURN TO MONARCH



BANDSAW, horizontal wet model, has 10x18-in. capacity. Made by Johnson Mfg. Corp., Rm. 624 Chrysler Bldg., New York 17, N. Y. Coolant plays directly on cut from nozzle fastened to back of front saw guide, does not need to be adjusted. Pump starts and stops automatically, is integral with the machine, can be disconnected for dry cutting. Coolant receptacle can be removed for cleaning and draining. An improved hydraulic control is incorporated to give correct constant feed for every section



INDEX-TYPE MILLING machine handles exhaust and intake manifolds. There are three stations: at first station parts loaded and unloaded; second station, back of flanges milled; third station, stud clearances form milled. All motions except work clamping are pushbutton controlled, and 93 pieces can be produced per hr. Station two uses Cross No. 101 vertical column, and station three uses Cross hydraulic way-type feed unit. Power-driven 36-in. index table is also standard unit. Made by The Cross Co., Detroit, Mich.

Lightweight Aluminum Conveyor Announced by Rapids Standard

A lightweight aluminum gravity wheel-type conveyor has been introduced by The Rapids-Standard Co., Inc., Grand Rapids 2, Mich. It is made in 5, 6, 8 and 10 ft. lengths in one width of 12 in. An 8-ft. section weighs only 31½ lb. Standard self-locking Rapid-Flexible hook and bar couplers, similar to those on the steel Rapid-Wheel conveyor, permit coupling to other Rapids-Standard material-handling equipment. No tools are necessary to set up a series of sections for operation.

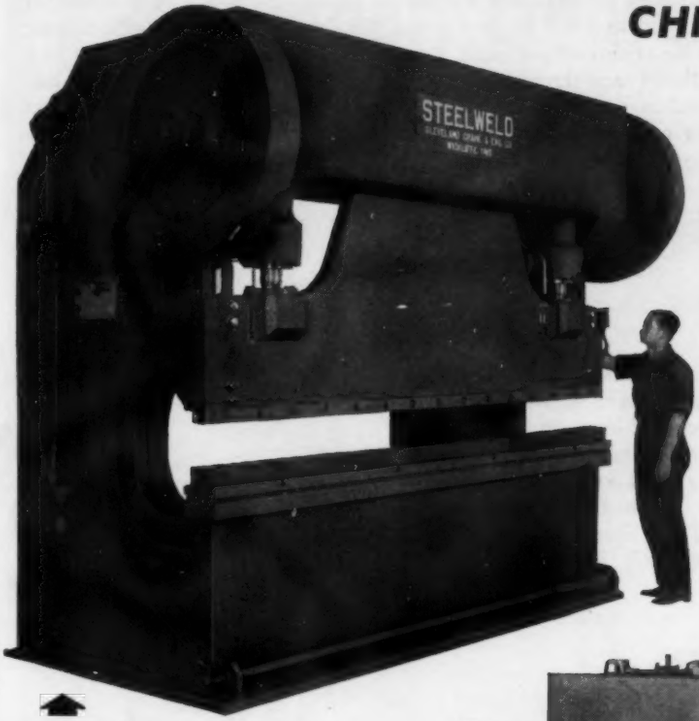
Two Aro Air Screwdrivers Incorporate Friction Clutch

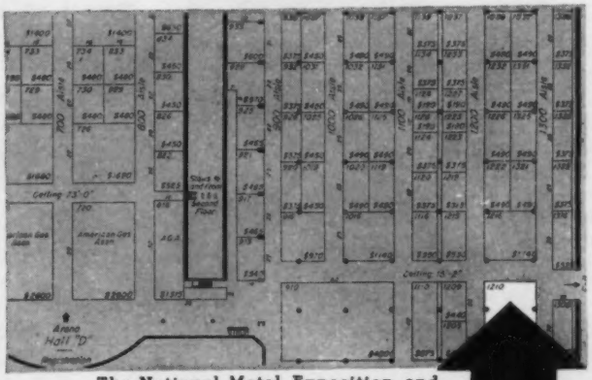
Two air screwdrivers, Models 7037 and 7039, have been added to the line of The Aro Equipment Co., Bryan, Ohio. For No. 4 to No. 8 wood or machine screws, they have a new friction-clutch attachment, using ¼-in. hex shank bits or ¼-in. hex adapter with square drive for nut setting. The clutch is designed to permit greater travel range of the adjusting nut, which controls the tension of the clutch spring.

Model 7037 (illustrated) has a lever throttle. The other unit has a pistol grip. Over-all length is 8¼ in., and weight is 1¾ lb. Speed is adjustable to 1800 rpm. The screwdrivers are furnished with speed regulator, one finder, and three bits of size specified.

SEE THESE MACHINES IN OPERATION *at the* NATIONAL METAL EXPOSITION

CHICAGO, OCTOBER 18 to 24

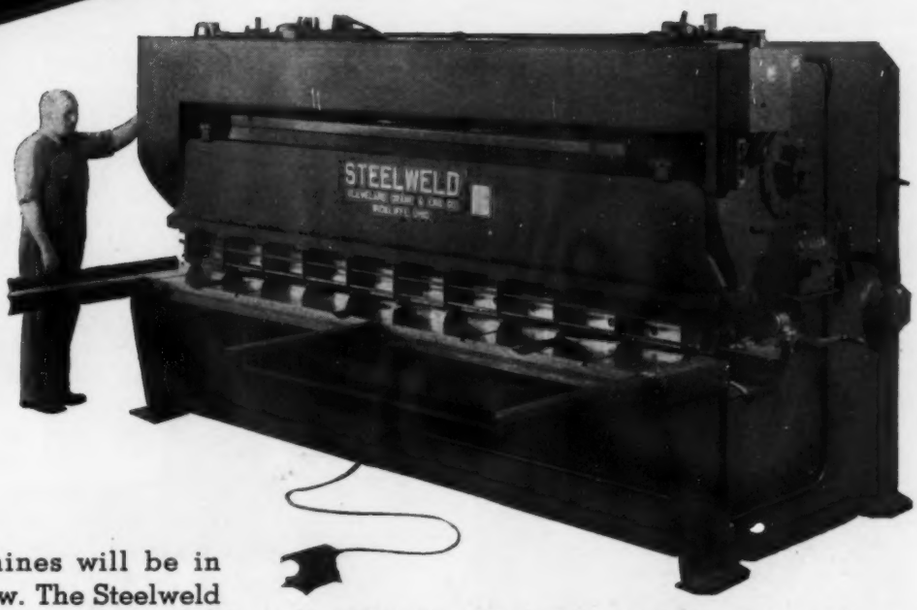




The National Metal Exposition and Congress will be held at the International Amphitheatre in Chicago.

SPACE No. 1210

STEELWELD PRESSES speed production of parts that would be difficult and costly by ordinary methods. They lower costs because press work is fast and dies are usually simple and inexpensive.



STEELWELD *Pivoted-Blade* **SHEARS** are radically different from all other shears. They have no slides or guides to wear out, and offer many outstanding advantages including electric foot switch operation.

These two heavy-duty machines will be in operation at the big Metal Show. The Steelweld Press has a bending capacity of 14' x 1/4". The Steelweld Shear is rated to cut 12' x 3/8" steel plate. Multi-hole punching, bending and shearing will be demonstrated.

We urge you to see these modern, versatile tools.

Readily adaptable to jobbing work or long production runs, they have numerous features — many heretofore unavailable — that enable you to handle more kinds of work, quicker, better, easier.

THE CLEVELAND CRANE & ENGINEERING CO.

1413 EAST 281st STREET • WICKLIFFE, OHIO

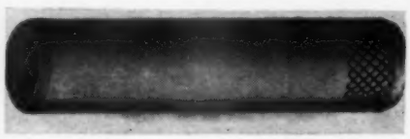
STEELWELD PRESSES AND SHEARS

Eclipse Bench-Type Oven Furnace Suitable for Intermittent Use

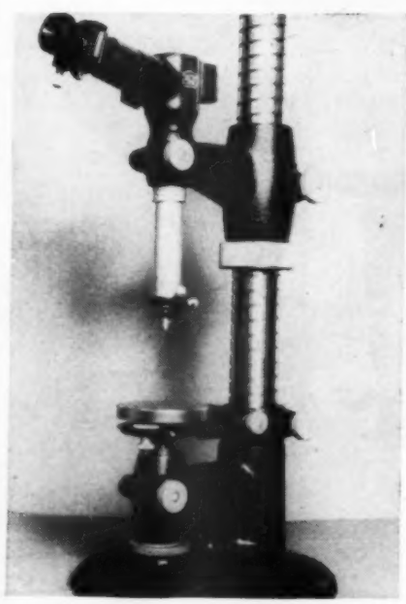
The Model 1-B bench-type oven furnace has been improved by Eclipse Fuel Engineering Co., 764 S. Main St., Rockford, Ill. The combustion equipment is designed for use with low-pressure air (10 to 16 oz.). It includes burner and McKee proportional mixer. Temperature range is 1400 to 1600 F. The unit is fully enclosed for protection. It is suitable for intermittent use in hardening punches, dies and small tools and for brazing applications.

Wet or Dry Grinding, Polishing on Hammond Model OD-1 Centerless

The OD-1 cylindrical grinder-polisher for rods, bars and tubes from ⅛- to 1¼-in. dia. has been added to the line of Hammond Machinery Builders, Inc., Kalamazoo, Mich. A 4-in. wide x 60-in. long coated abrasive belt is used, and it can be operated wet or dry. Work supports handle ½-in. bars up to 18 ft. long, and 1-in. bars up to 8 ft. long. Accuracy on production items is said to be 0.001 in., and up to 0.005 of ferrous metal can be removed per pass. Two feed methods are employed: through feed and in feed. Feed rate on this machine can be varied from 0 to 18 fpm.



DOWEL PIN is self-sizing, has knurled end which acts as shear when driven in. Hole is sized and irregularities removed. Pin is ground to 0.001 in. oversize, and body and knurled section have same dia. Made by Baumbauch Mfg. Co., 1812 S. Kilbourn Ave., Chicago 23, Ill.

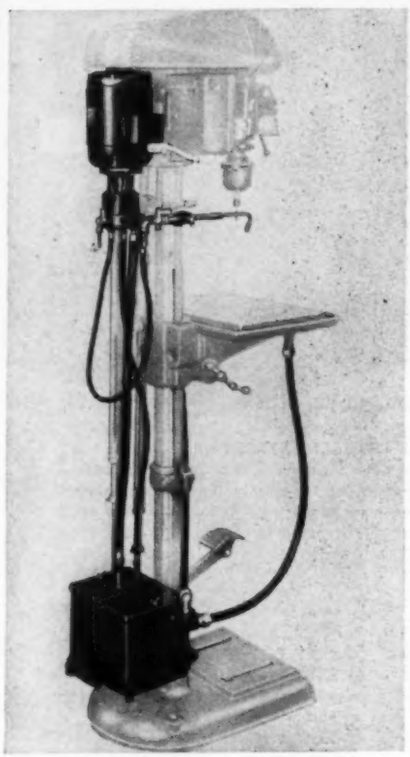


SAGEM Metrological Comparator Compares External Dimensions

The SAGEM vertical metrological comparator is available from E. Leitz, Inc., 304 Hudson St., New York 13, N. Y. It is designed to permit precise comparison of external dimensions between gage blocks (or master samples) and gages, jigs, or production parts. Consisting of worktable and comparing mechanism mounted on common base, it can be set on any table or bench.

A SAGEM universal comparator sight, Type 1, is used. It can be furnished with either metric or inch scales. Inch scales are graduated either 0.00005 or 0.0001 in., with a range of ± 0.004 in. A vernier permits reading one additional decimal place on either scale. The comparator can also be used with a dial indicator calibrated in 0.01 mm. (0.0004 in.).

Comparison is made by first adjusting the contact pin to correct height by using gage blocks or master sample. Then work is substituted, and any deviation in location of the contact pin is magnified 1000:1 and shown directly as a scale reading in the ocular.



Continuous Flow of Lubricant In Procunier Tapping Machines

A universal tapping machine series has been announced by Procunier Safety Chuck Co., Dept. AM, 18 S. Clinton St., Chicago 6, Ill. The units incorporate the Hi-Boy motor-driven gear pump which supplies a continuous flow of lubricant to the tap. This flow is supplied while the tap is backing out, as well as during tapping, and helps to wash away chips and shavings.

Tap driving and reversing pressures are preset by long, compensating springs which are said to maintain proper pressure to tap regardless of pressure on the pedal. The machines are made in two sizes: Series A, which has capacity from No. 2 tap to 5/16 in. in steel, and Series B, which has capacity from No. 10 tap to ½ in. in steel.

Arbor Press of Welded Design Is Stronger, Lighter, More Economical

By K. A. Ruger, President
Ruger Equipment Co., Inc., Cleveland 14, Ohio

FOLLOWING the modern trend in machine design, the new Ruger 10-ton portable hydraulic arbor press was designed for arc welded steel construction for two reasons: (1) because we have found arc welding is generally the most economical fabricating process; (2) to achieve the greatest strength from the least weight. The Ruger press can easily be moved from place to place by one man as the total weight is only about 100 lbs.

Fig. 1 shows the component parts. The plates are SAE 1020 mild steel, cut out on a flame-cutting machine guided by templates. The two side plates are braked to a 1⅛″ offset so they are closer together at the top. The base angles are formed from ⅜″ flat plate on a brake and the corners rounded on the flame-cutter. The cylinder cover is seamless steel tubing bored out to take the hydraulic cylinder.

The sides, angles, spacer plate and cylinder cover are assembled in a jig and tack-welded together. Nearly all welding is done in this jig, which is tilted to various positions for 100% downhand welding. Fig. 2 shows the cylinder cover being welded to the side plates.

Maximum welding speed is obtained by using Lincoln "Fleetwelding" technique—single pass, deep penetration welds in downhand position. "Fleetweld 11" electrode is used because of its speed, penetration and smooth concave bead which requires little finishing.

The side plates are welded to the base angles with the jig at a 45° angle (Fig. 3) to make single-pass fillets. The spacer plate is welded to sides with 1″ intermittent welds and the ends of the base angles are butt-welded to the sides. The press is

Fig. 2. Welding cylinder cover to the side plates.

then removed from the jig, turned upside down and the angles joined to bottoms of the side plates with deep groove butt welds.

The cylinder welds are then ground down flush with the sides, and the other welds cleaned with a grinder. The hydraulic pump assembly is installed and a 16-gauge sheet metal cylinder cap is welded on with "Fleetweld 7," which makes a convex bead for a neat, rounded appearance. Then the unit is painted and crated.

Fig. 4 shows the completed press. Its overall dimensions are: 23½″ high, 11¼″ wide and 20″ long from front to back. The throat height is 11″ and ram stroke is 6⅝″. Ram automatically retracts to top position by a built-in counter balance.

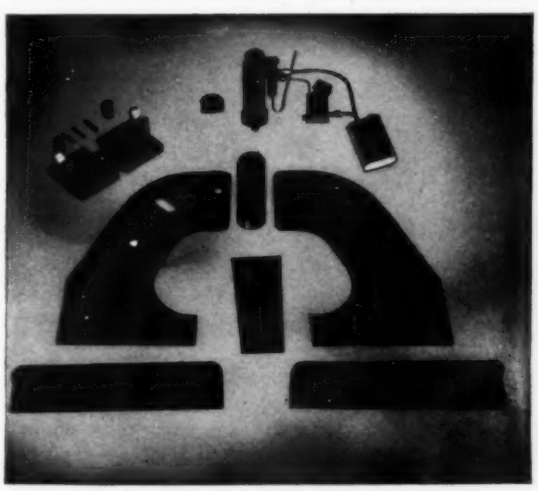


Fig. 1. Component parts of the Ruger Press.

Fig. 3. Welding base angles to side plates.

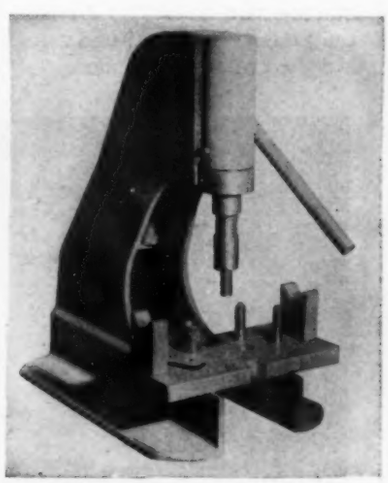
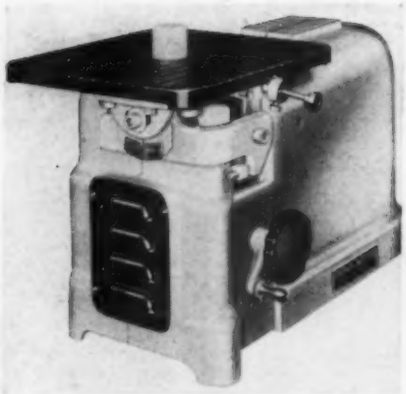


Fig. 4. The completed press.

The above is published by LINCOLN ELECTRIC in the interests of progress.
For Studies in Machine Design, write The Lincoln Electric Company, Dept. 219, Cleveland 1, Ohio.



Worktable Has Four-Way Tilt On Milwaukee Profile Grinder

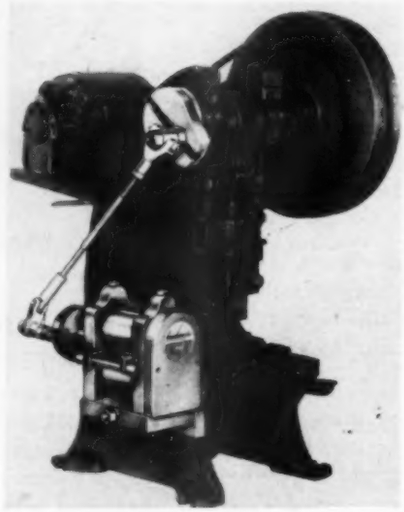
A bench-type high-speed profile grinder has been developed by Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis. The worktable on the unit can be tilted 15° in any direction, with angle of inclination indicated by graduated dial and pointer. The table also has 3¼-in. vertical adjustment by means of a crank. The design permits precision grinding of interior and exterior profiles, curved, odd and irregular surfaces.

A built-in diamond dresser is provided. No cleaning or assembling of loose parts is required prior to wheel dressing. The diamond, which slides in a sleeve, is brought close to the wheel and the holder is locked in position. The diamond is then fed to the wheel by rotating the sleeve.

The motor drives the spindle at 20,000 rpm. and provides power to take grinding wheels from ⅛ to 1½ in. The spindle reciprocates ⅛ in. vertically 100 times per min. By removing two bolts, the front half of the housing can be lifted off, exposing the entire mechanism.

Alnor Electronic Controller For Furnaces, Melting Pots

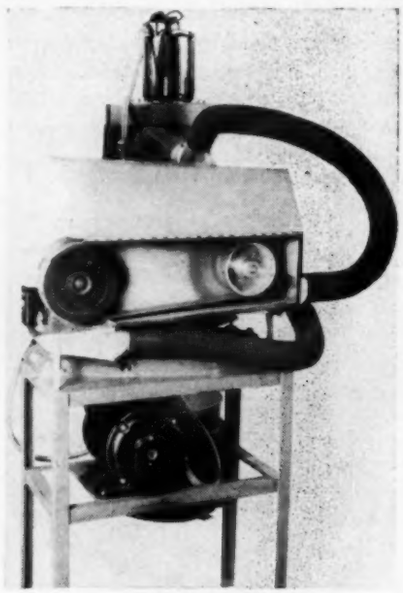
An electronic pyrometer controller for furnaces, melting pots or any heating device using electricity, gas or oil is available from Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago 10, Ill. Known as Alnor Controller, it is used for both production and laboratory operations. A 6-in. mirrored scale and a weather-proof case are featured. Ruby "eye" indicates on and off conditions of heat supply. Pyrometer movement is double-pivoted on jewelled bearings.



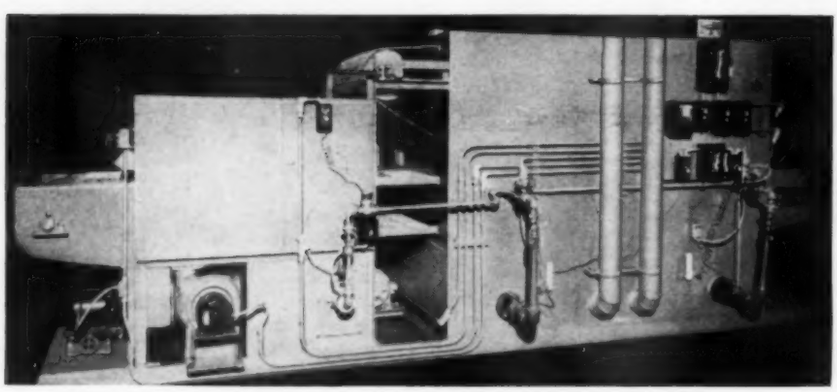
Automatic Friction Roll Feed For Presses by Benchmaster

An automatic friction roll feed for presses has been announced by Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles 6, Calif. It is designed for all Benchmaster punch presses, as well as most standard units, and is used with metal, wood, plastic, cardboard and felt.

The friction drive is geared down to give 0- to 3-in. adjustment in feed. Stock up to 3 in. wide can be handled, with thickness from 0 to 3/16 in. in thousandths. Height adjustment is 0 to 2¼ in. Full operation is 285 per min. Rollers can be reversed from forward to backward in a few seconds.



DUST CONTROL for this Jones Model 135 bench grinder and backstand idler is provided by a Torit-built hood surrounding the abrasive belt and connected by 3-in. hoses to a 13-FB dust separator. Other hooding systems recently developed by Torit Mfg. Co., St. Paul 2, Minn., are for surface grinders, buffing and polishing wheels, and for abrasive belts used with polishing lathes



TRIPLE-STAGE WASHING machine processes light, small, cup-shaped stampings of comparatively uniform depth, is gas heated. It washes, rinses and dries parts in three stages. Any one of the three stages can be eliminated or others added. Made by Mabor Co., Clark Township, Rahway, N. J.

SKYLIFT is capable of tiering to truck and trailer ceilings as low as 68 in., yet has total lift of 100 in. for storage-area stacking. Made in capacities of 2000, 3000 and 4000 lb. by Automatic Transportation Co., 149 W. 87th St., Chicago, Ill., it is a modification of the Skylift telescopic, tilting, hydraulic-lift, electric fork truck

1. BOLO KNIFE

An all-purpose knife native to the Philippine Islands although it resembles the South American machete. It's a large single edged knife used for cutting brush, making shelters, huts, for hunting and self-protection.

2. ALEMITE

REG. U.S. PAT. OFF

Modern Lubrication Methods that CUT PRODUCTION COSTS

Knives are great for their jobs. But it takes "know how" and experience to cut production costs without sacrificing quality.

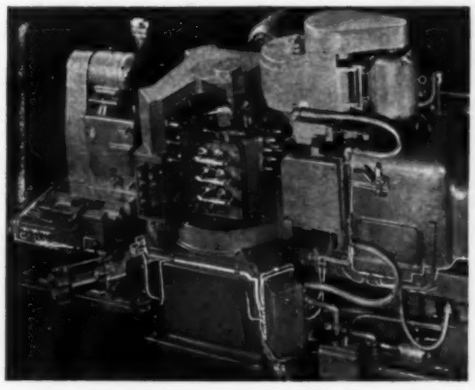
So, listen to this news. In big and little businesses, from food processors, to contractors, to industrial giants —Alemite methods are adding More Productive Time to machines while reducing production costs thousands of dollars a year.

For example—a contractor cut track roller bearing failures by 25% . . . reduced his lubricant requirements by 20% . . . cut maintenance costs all around.

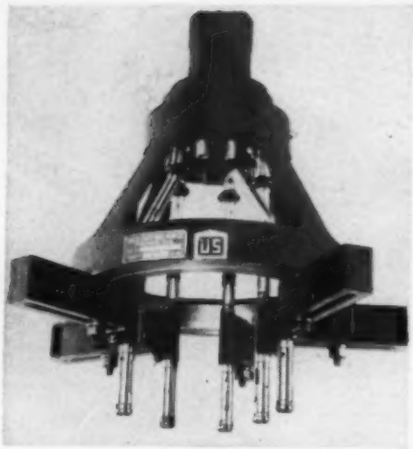
A large foundry, since installing an Alemite System, has ended an epidemic of expensive bearing failures . . . added More Productive Time to the whole plant while reducing production costs.

Just a couple of examples. But in your search for ways to cut your production costs without sacrificing quality, find out what Alemite can do for you. The Alemite Lubrication Representative has probably helped to solve problems identical or similar to yours. For an interesting conference at your desk, without obligation, write Alemite, 1899 Diversey Parkway, Chicago 14, Illinois.

STEWART WARNER



Using an Alemite Centralized System this machine tool's bearings are lubricated in seconds from one central point. The machine produces *during* lubrication, maintenance costs are down, production is up, bearing failures are ended. Just one of the many ways Alemite helps industry cut production costs.

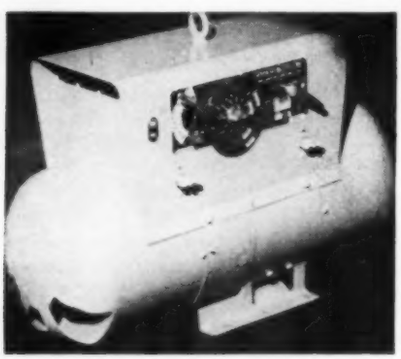


U. S. Universal-Joint Drillhead Handles Two to Ten Spindles

An adjustable multiple-spindle universal-joint drillhead has been announced by U. S. Drill Head Co., 616 Burns St., Cincinnati 4, Ohio. Two to ten spindles, with No. 1 Morse taper, can be furnished. Each can drill ½-in. dia. hole in cast iron. Spindles can be adjusted to any hole pattern within 10-in. dia. circle, with minimum center distance between any two spindles of ⅞ in.

Spindles can also be furnished with No. 2 Morse taper, increasing capacity to ¾ in. in cast iron. Larger universal joints are provided, drilling area is 9¾-in. circle, and distance between two spindles is 1⅜ in.

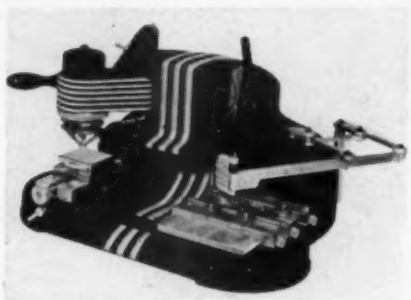
Vertical adjustment, Erickson precision chucks and heavy-duty ball-thrust bearings can be furnished. Joints can be removed in a few seconds without the use of tools.



GE Heavy-Duty dc. Arc Welders Have Single-Dial Dual Control

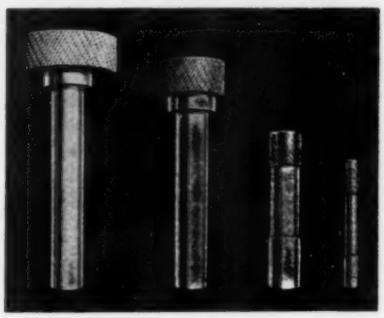
A line of heavy-duty single-operator dc. arc-welding machines, Type WD-40, has been announced by General Electric Co., Schenectady 5, N. Y. Designed to provide 50% weight savings, they operate at 3500 rpm. and are available 200-, 300- and 400-amp. NEMA ratings.

A single-dial dual control permits the operator to preset correct current for a given job without having to make other adjustment after arc is struck. Full arc voltage is said to be generated instantly after short circuit, permitting arc to be easily established and maintained. Current peaks are said to be adjusted to eliminate excessive weld spatter.



Automatic Engraving, Profiling Performed on Airdraulics Unit

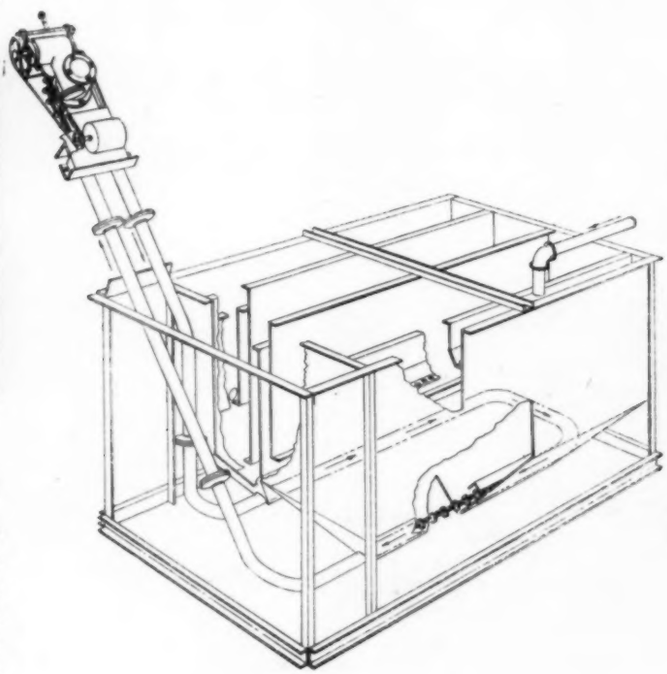
An automatic engraving and profiling machine is announced by Airdraulics, Inc., 100 W. 101st St., New York 25, N. Y. Designed to handle almost any type of material, the machine does profiling on a 1:1 ratio. It is also supplied with a Pantograph which permits engraving at a standard reduction ratio of 3:1. Other ratios can be had upon request. Operation requires only placing of lettering, templets or drawing on one side of the unit and tracing with the arm of the Pantograph. Engraving is done on the work in full view of the operator. The adjustable vise holds work to 5x8 in., and areas up to 4x4 in. can be engraved. Dimensions of unit are 21x21x14 in. high.



CARBIDE BURS for internal grinding, jig grinding, and blending and finishing by off-hand grinding. Made in standard sizes for 1/16- to ¾-in. tool dia. for operation at conventional speeds by M. A. Ford Mfg. Co., Inc., 780 W. 1st St., Davenport, Iowa

Sintered Tungsten Carbide Used To Protect Johansson Gage Blocks

Johansson Div., Ford Motor Co., Dearborn, Mich., announces the use of sintered tungsten-carbide guard blocks to provide extra wear and protection for Johansson gage blocks. The guard blocks come in thicknesses of 0.100 and 0.050 in. and are available in both A and B standards of ± 0.000004 and 0.000008 in. Guards are simply wrung onto the end of any "Jo-block" combination.



SLUDGE TANK is self cleaning, incorporates pipe conveyors which have synthetic-rubber flights mounted on sealed pin chains. Tank has double V-bottom for rapid sludging. Made in two sizes with 400- and 3200-gal. capacity by Hapman Conveyors, Inc., Detroit 21, Mich.

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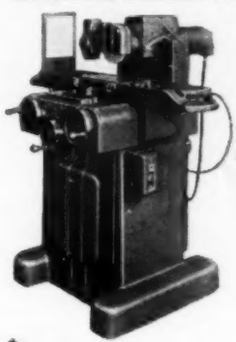
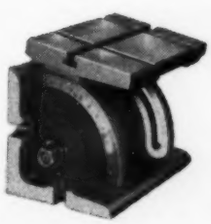


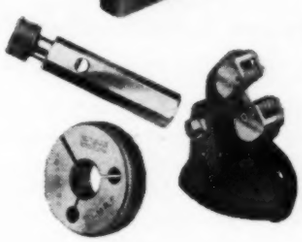
MACHINE TOOLS:

The No. 1 Precision Surface Grinder (shown) brings new standards of precision, flatness and finish to all work up to 5" x 12". T-P also builds a 6" Rotary Surface Grinder, and a Back Spot Facing Machine. Send for bulletins on these machines.



PRODUCTION AND INSPECTION TOOLS:

The T-P line includes toolmaker's knees, sine bars, V-blocks, squares, parallels, surface plates, bench centers, angle-measuring equipment, and many other essential small tool items. Send for the new 1947 T-P Handbook.

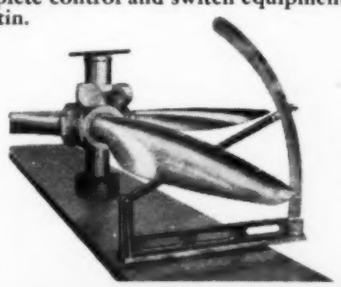


STANDARD AND SPECIAL GAGES:

All types of AGD Standard plug, ring, snap, and thread gages. Special designs made to specifications. Send for new Handbook.

MAGNETIC CHUCKS:

All types and sizes of rectangular, rotary, and tilting-base *Superpower* Chucks of exclusive Taft-Peirce design. Complete control and switch equipment. Write for new bulletin.



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Aircraft propeller protractors, balancing stands and checking plates. Propeller-hub boring machines. Send for new Handbook.

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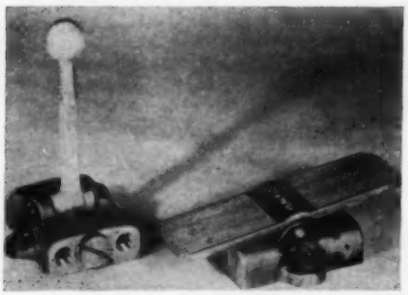
THE TAFT-PEIRCE MFG. CO., WOONSOCKET, R. I.

Parts and Materials



Small Ross Poppet-Type Valve Made in Lever or Treadle Types

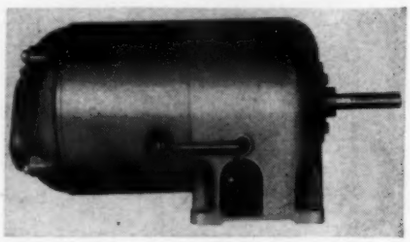
A small poppet-type valve for operation of light machine tools, vises, fixtures, presses and other machinery adaptable to air control, is announced by Ross Operating Valve Co., Dept. K, 6489 Epworth Blvd., Detroit 10, Mich. The valve can be three- or four-way in either lever or treadle types. It is available in locking, non-locking or neutral-position types.

Precision Inching Afforded By Yardeny Pulsing Drive

The Pulsing Drive for controlling electric motors when accurate positioning is important is produced by Yardeny Laboratories, Inc., 105 Chambers St., New York, N. Y. Motors of any type and characteristic, from fractional to 25 hp. or more, can be connected to the unit. By slowly turning the control knob in one direction, a series of short electrical impulses is applied to the motor winding, causing motion in small increments. When the knob is rotated the other way, the motor turns in the opposite direction. Length of time increment during which the motor turns depends on the speed of knob rotation. Applications include inching of machine tools, conveyors and presses.

Redmond Type "T" Micromoter Has Air-Stream Cooling System

The improved Type "T" ac. Micromoter, made in sizes from 1/25th to 1/100th hp., is announced by Redmond Co., Inc., Owosso, Mich. A four-pole shaded pole motor, it has a three-piece die-cast frame with an outer shell enclosing the air-stream cooling system. Porous bronze bearings retard gumming by filtering lubricant, and large-capacity reservoirs prolong bearing life. Positive oil return is said to be accomplished by oil slingers and retainers. The motor is cradled in large live-rubber cushions held in place by steel cups.

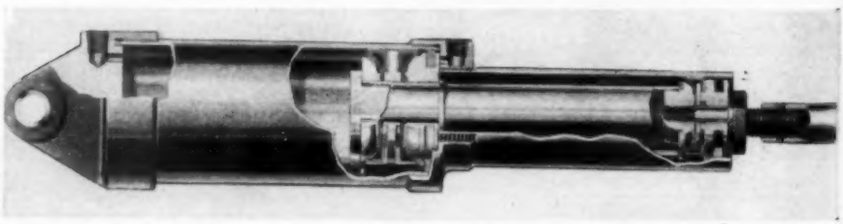


Lima's Type R Gearshift Drive Has Integral Single-Phase Motor

Four-speed, Type R, Lima gearshift drive, which has an integrally mounted single-phase motor, is announced by The Lima Electric Motor Co., 1501 Findlay Rd., Lima, Ohio. For machinery requiring selective speeds, it is made in sizes of ½ hp. (at 1200 rpm.) and ¾ hp. (at 1800 rpm.). Gear ratios are 1:1, 1.33:1, 2:1, and 4:1. These single-phase units are mechanically the same as the polyphase units, and they operate on 115 and 230 v. ac.

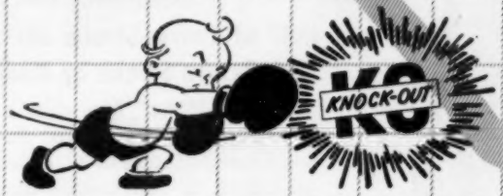
Hydrex Water-Shedding Liquid Made by Enthone, Dries Metals

Hydrex, a water-displacing liquid for drying metals, is announced by Enthone, Inc., Dept. AM, 442 Elm St., New Haven, Conn. The liquid is said to have a high penetrating power to enable it to displace water from blind holes and crevices. After the water has been displaced, the work is withdrawn and the solvent evaporates, leaving a water-free surface with some rust-inhibiting properties. Water separates to the bottom of the liquid and can be drawn off periodically.



DIFFERENTIAL AIR engines operate with only one controlled air line. At 100 psi., engines cover range from 100- to 1335-lb. on in-stroke, and 105- to 1070-lb. on out-stroke. Pressure acts on large and small ends of piston assembly, resulting in force equal to difference between two areas. Made by National Pneumatic Co., Industrial Sales Div., Rahway, N. J.

Tool Maintenance Costs Come Down...



WHEN YOU USE A "KNOCK-OUT" Universal Cutter Grinder

Tool Maintenance Costs Come Down when you use a "Knock-Out" Universal Cutter Grinder.

Set-ups are simpler, easier to make—less time is lost between jobs—more tools of all types can be properly reconditioned at less cost with a "Knock-Out" Universal Cutter Grinder. Handles internal, external and surface grinding too. A "Knock-Out" Universal Cutter Grinder is the busiest machine in any Tool Room.

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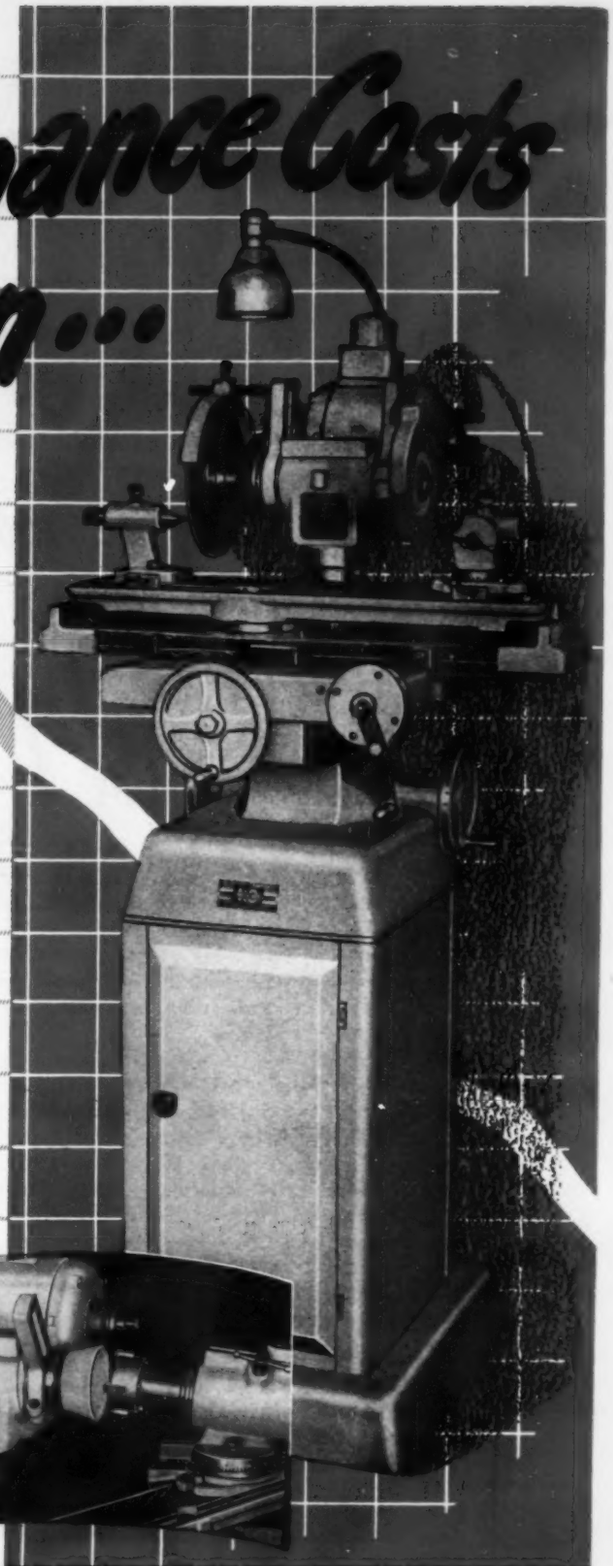

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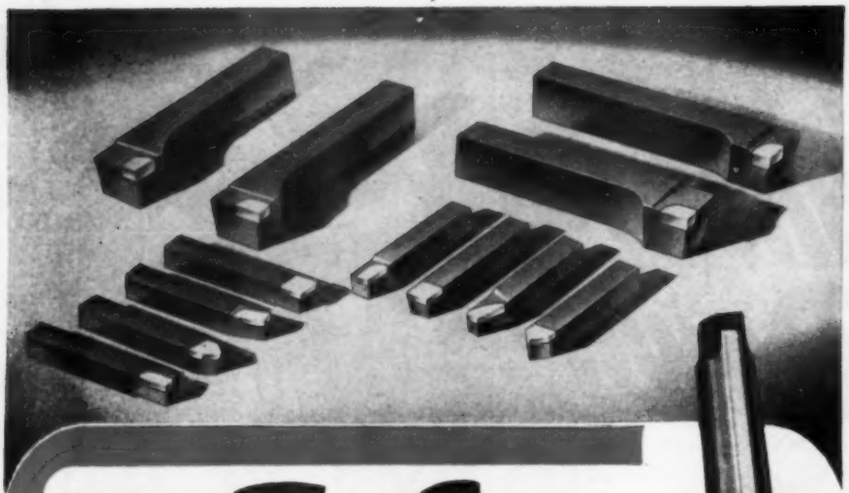

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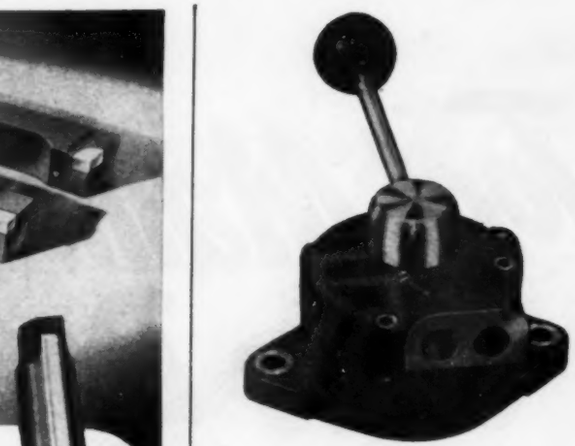
Champion's strength, accuracy and staying power are built into Celfor Twist Drills, Reamers and Carbide Cutting Tools—built in by Clark's extraordinary wide and varied experience in serving many industries; by Clark's engineering that led the way to many tool improvements; by Clark's changeless belief in fine workmanship.

It's a good platform, three-ply, substantial—Celfor Tools.

Send for the Celfor Catalog—brings you complete specifications; and an invaluable Engineering Data section—28 pages of solid "meat."



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Prices on CLARK products will not be advanced in excess of increased costs.

Half of Power-Stroke Air Used For Return Stroke by Knox Valve

The "Air-Miser" four-way air valve is announced by Knox Industries, Inc., Lexington, Mich. It has a by-pass port in the bronze disk which allows half of the compressed air used in the power stroke of a double-acting air cylinder to be used to return the piston. This air is usually exhausted into the atmosphere on conventional type valves. The design would reduce load and volume from the air compressor by 50%. The valve also has an auxiliary port if more air is needed to return the piston, and a neutral position for use when the cylinder is idle.

Cooling Water Shut Off By Weltronic Water Saver

The Weltronic Water Saver relieves the operator of the duty of turning on or shutting off cooling water in a welding operation. Made by Weltronic Co., Dept. K, 19420 W. Eight Mile Rd., Detroit 13, Mich., it can be used with any type welding machine. It is designed so that its two control relays and solenoid-operated water valve are de-energized if the welding machine stops for a period of time longer than 30, 60 or 90 sec. (the three-time ranges available). When the welder is started, the Water Saver is energized and water flows.

Airco No. 312 Electrode Improved

Airco No. 312 electrode has been improved by Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y. It is an all-position mild-steel electrode designed to produce low-hydrogen-content welds.

Formerly the electrode could only be used on dc. reverse, but now can be used on both ac. and dc. reverse-polarity. Another improvement is that it no longer requires preheating to obtain porosity-free welds.

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The high electrical efficiency of Exide-Ironclad Batteries is due largely to the unique construction of the positive plates. Each of these plates consists of a series of slotted, hollow tubes which contain the active material. So fine are these slots that, while they permit easy access of the electrolyte, they prevent the active material from readily washing out. Not only does this add to life of plates . . . and battery . . . it also provides higher power ability and capacity, assuring dependable, day long performance with maximum safety and minimum maintenance.

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Continuous 100% Reconditioning of Industrial Oils...

Oil of uniform clarity is delivered continuously by these two, new Hoffman units. Soluble impurities—such as air, water, gas and fuel dilution—are removed in the Hoffman VAPORIZER. And *insoluble* impurities including oxidized hydrocarbons, are filtered out in the Hoffman CARTRIDGE FILTER. Together, these two units give you complete reconditioning of oil for better, lower cost production.

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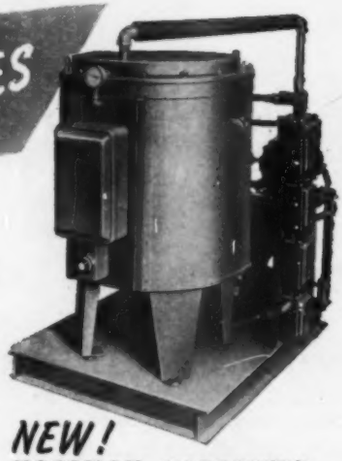
A compact unit (portable, if desired) that passes oil over trays, induction-heated by electricity and under vacuum, to drive off fuel dilution, water, air and gas from any straight mineral, compounded or synthetic oil. ONLY TWO MOVING PARTS...no steam or water connections. Top flow rates.



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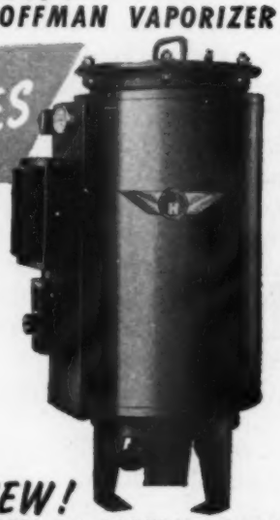
The I-1118 series of Hoffman Cartridge Filters is available in cartridge multiples of 1, 2, 3, 4, 6 and 8. Unique design and arrangement of filter element (using repackable or throwaway cartridges) provides a simple, efficient means of filtration. Available with or without heaters and controls to meet service conditions.



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COOLANT FILTERS · FILTRATION ENGINEERING SERVICE

Pressure Differentials Measured By Barton Model 181 Indicator

The Model 181 Differential Pressure indicator which measures flow, liquid level and pressure differentials is available from Barton Instrument Co., 3500 Union Pacific Ave., Los Angeles 23, Calif. It has a 6-in. dial, and the differential pressure range is 0 to 50 in. of water up to 0 to 200 psi. Static pressure ratings extend to 3000 psi. Constructed of drawn bar stock with brass rupture-proof bellows, it has 7¼-in. dia. 4-in. depth.

SE-CO Packless Stem Valve For Welding-Gas Cylinders

The SE-CO packless stem valve for oxygen and acteylene cylinders has been developed by Security Valve Co., 410 San Fernando Rd., Los Angeles 31, Calif. Said not to freeze in either open or closed position, the valve cannot be disassembled by turning the spindle past open position. A brass retaining washer, that is free to rotate, stops upward motion of the spindle at wide-open position. Downward motion of spindle is halted by metal-to-metal contact and a Neoprene seat. Gas pressure is utilized to increase seal effectiveness. Operating pressures are 1 oz. to 3500 psi., at temperatures from 70 to 250 F. Open height of the valve is 4½ in.

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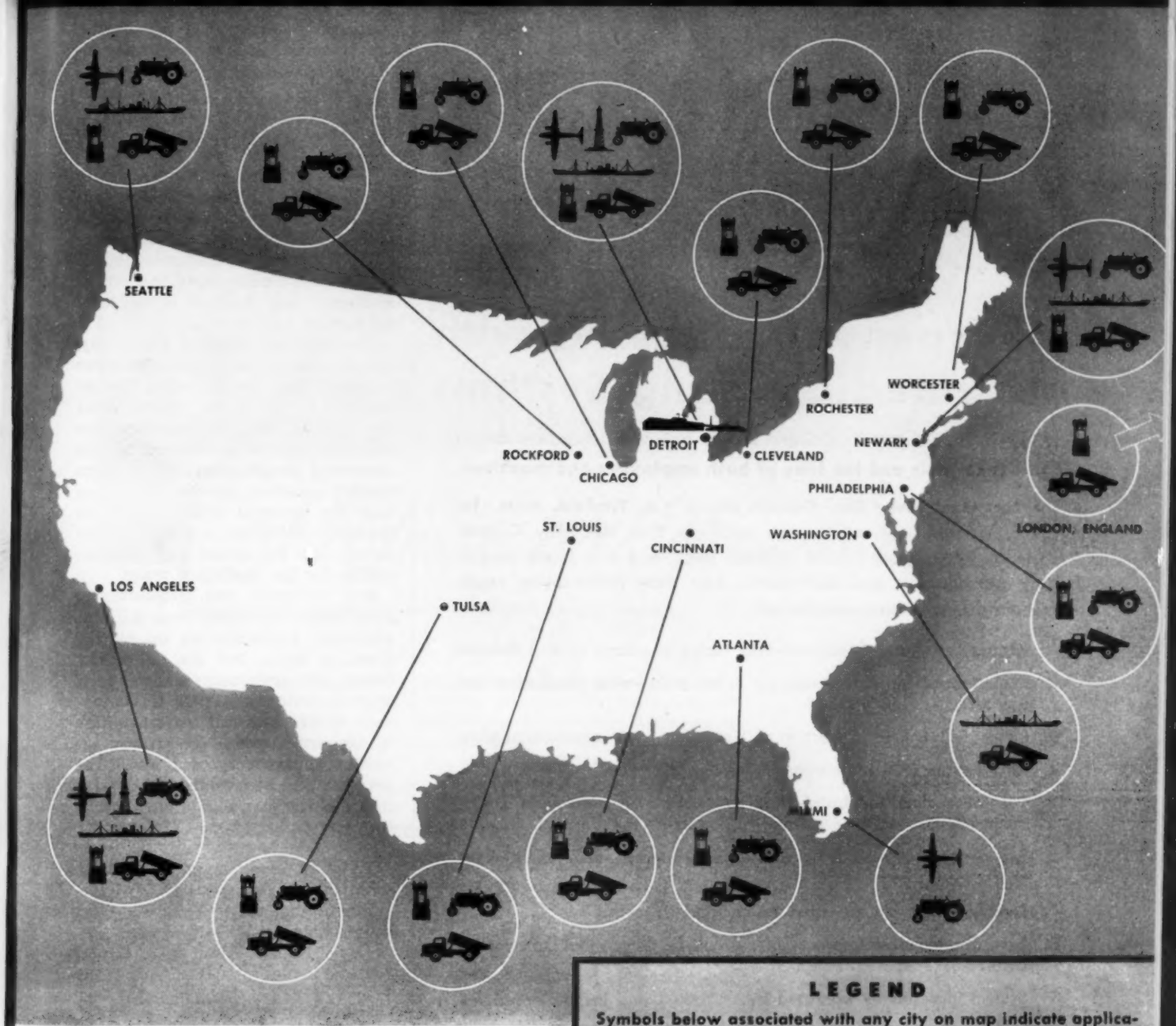

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Tool Expense is Excessive with Antiquated Checking Systems

Change to McCaskey Tool Control and you will save in a dozen ways—save tools and the time of both employees and machines.

The East Plant Motor Div., General Electric Co., Pittsfield, Mass., for example, reduced tool requirements and loss thru McCaskey Control. Mr. Charles W. Reagan, Tools & Methods Dept., told in a recent issue of Factory Management and Maintenance how these dollar-saving results were gained over a three year period:

1. Repaid cost many times over—vital factor in success of tool division;
2. Requirements by departments cut to minimum—more production with less tools;
3. Inventory loss held to fraction of 1 percent—losses almost negligible;
4. Hoarding of tools discouraged;
5. Clearance time for transferring or terminating employees cut to minimum—invaluable in placing responsibility for tools;
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Whether you have one or several cribs for production or maintenance work, McCaskey Control will cut your tool costs and prevent production delays. Write for a reprint of Mr. Reagan's article, "Flexible Tool Control Repays Costs Many Times Over," and similar reports of cost-reduction and improved operations in other well-known plants.

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ROUND TABLE Discussion

WHO HIRES 'EM?

As works manager in charge of the administrative side of an engineering workshop in India, I wish to offer some comments that may be of interest to other readers.

We have a personnel section which keeps records of all workers employed and also of applicants who are not taken in for lack of posts. But by far the larger number of appointments are made by the foremen of the various departments direct, to be confirmed by the works manager. Our normal strength of workers is 400.

The foreman alone, I would say, is in a position to judge a person's suitability for the job, either by interview alone or by actual trial. Mere certificates and previous records, the criteria considered by the personnel people, won't do, as even highly qualified persons sometimes lack the practical skill required in the shop. Moreover, a general designation does not insure a man's suitability for the particular trade.

For instance, we requisitioned some motor mechanics from the Employment Exchange set up by the Govt. of India, but the applicants, mostly ex-servicemen, were experts only in fitting a particular component which they had been handling in the army, and were wholly ignorant about everything else. The personnel section would not be able to assess the man's suitability unless the man is sent to the foreman for trial.

The best arrangement is for the foreman and personnel to work together so that the best and the most suitable men can be employed.

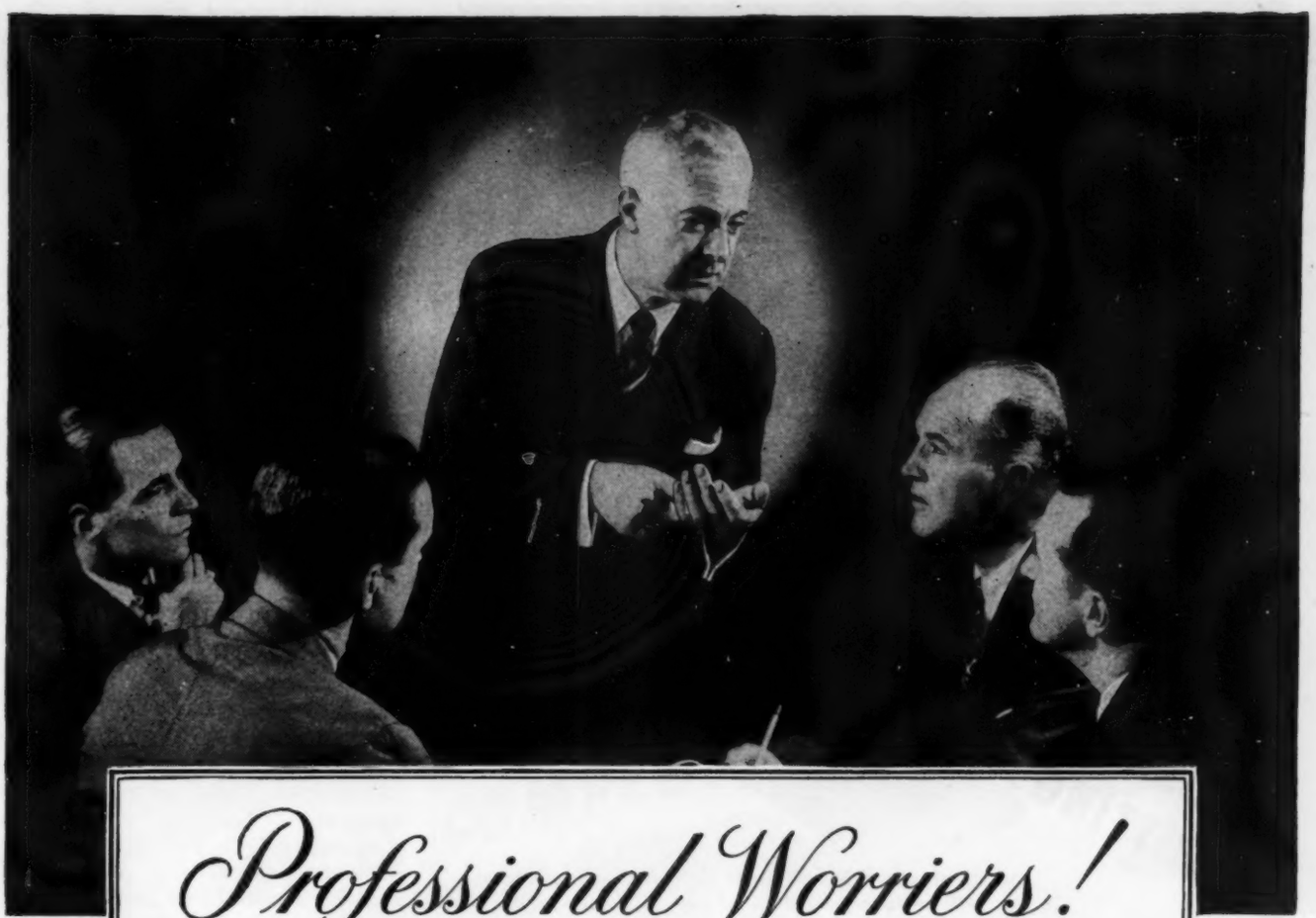
R. K. Bausal
Calcutta, India

•

SNOOPERVISOR

In a small L-shaped works of two floors the manager-foreman was addicted to spying. To get to the upper floor, it was necessary to ascend an open staircase from which, by stooping, a view could be obtained of the ground floor of the next shop. This spying was soon spotted—"the foreman saying his prayers"—and resented by the men.

The works were water driven and, because of the poor head of water,



Professional Worriers!

Every business, time and again, runs into production snags. When the problem is *lubrication*, we're often called in to do the worrying. And eight times out of ten we come up with the right answer—*fast*. Because that's our job day in, day out, year after year—putting petroleum to work *efficiently*. This backlog of experience, coupled with the world's finest lubricants and fuels, is your best reason for calling Cities Service next time trouble calls on you.

CITIES SERVICE STOPPED TROUBLE HERE!

A screw products company in Cuyahoga Falls, Ohio, called on Cities Service for advice on machining a part of an intricate mechanism made of aluminum that required extreme accuracy and finish. Chillo Oil No. 22 was recommended. Thereafter, the manufacturer reported the machined work was not only well within the required tolerances, but the work had a mirror-like finish. Tool life was also phenomenally good.

A brick and tile company in Iowa suffered numerous failures of the main drive-shaft bearings in their Hammer Mill Crushers. Cities Service engineers recommended Pacemaker Oil No. 2. The last report from the company said that since they standardized on this lubricant, no bearing failures have occurred.

"We use Solvent No. 26 for cleaning surplus oil and grease out of electric clock movements and we find it unexcelled for this purpose" ...so writes the president of an Illinois watch repairing and rebuilding concern after continued use of this remarkable new Cities Service metal cleaning fluid.

A bus company executive in Cleveland, Ohio, recently said, "During the past four years, we used Cities Service Heavy Duty type oil with outstanding results—minimum wear, freedom from sludge and no engine failures—which has enabled us to give uninterrupted service to our customers."

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COMPANY_____

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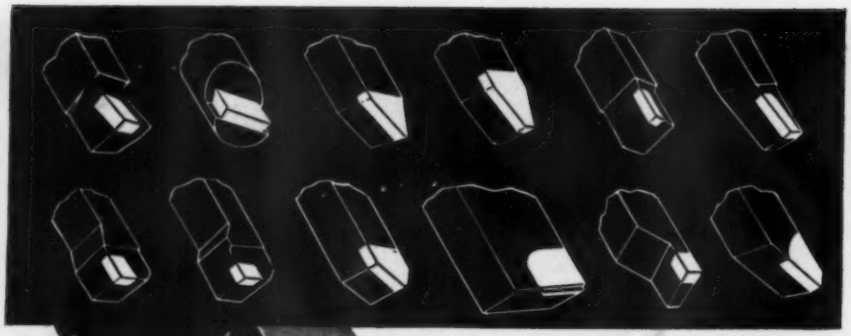

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W-S standard tool bits are "Color Marked" for easy identification as to use on steel or non-ferrous materials. All shanks are rust resistant—also heat-treated for greater rigidity. Cutting edges are diamond ground for longer wear and better finish. Use W-S carbide tools to increase your production . . . combat rising costs!

Free! NEW CHIP-BREAKER CHART

Contains illustrations of chip-breakers, grinding instructions, and recommendations for their use. Chart size—with handy tab for wall hanging. To get FREE chart WRITE: Wendt-Sonis Company, Hannibal, Missouri or 580 N. Prairie Ave., Hawthorne, Calif.; also Wendt-Sonis Chicago Warehouse, 1361 West Lake St., Chicago, Illinois.

WENDT SONIS

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power and speed were low. The ratio of the waterwheel pulley and that on the shop shaft was 4 or 5 to 1 times a load heavier than usual, and would cause the driving belt to slip, groan, and come off this relatively small pulley.

A youth found he could easily make this happen and decided he would "snoop" the snoopervisor. He worked a capstan lathe, carrying a fairly heavy self-centering chuck and having a fairly high speed. By putting the belt on the top speed and exerting a heavy thrust against an article held in chuck, the main driving belt would groan, slide and fall off. Quickly moving his striking gear to the off position, leaving his countershaft free to run, he pulled the cone belt from the top to the bottom step, stopped his headstock spindle from turning, turned his capstan to an innocuous position and, when the foreman came, summoned by the groan and the following silence, "butter would not have melted in his mouth." The inspection of his machine disclosed no stiffness and the mystery was not solved. The snoopervisor was very definitely snooped.

Snooping is a past time of the boomerang type, and its use is neither dignified nor useful. Does it ever pay? Its reactions can rarely be traced.

J. Ellward
Lincoln, England

•

SHOULD THE BOSS GET TOUGH?

Supervisors who cannot control themselves never make a success in their work.

A superivsor must know his men. If the boss does not call down some men on an average of once a week, they will not work. Others need to be patted on the back to keep them working. However, the call-down should not be made in a group meeting, unless all that are within earshot are involved in the same offense.

The technique of management may be changing, but I rather have my doubts. In the old days some bosses were considered better men to work for than others. It is just as true today. Not all supervisors felt it was necessary to yell at the employees in front of everyone. Today we still have men in the managerial positions who consider that they are "big shots" and that the only way to prove it is to bawl someone out.

No supervisor, if he keeps a well-organized department, will be considered an easy mark. It is, however, much more effective to talk to each

A Solution to REPETITIVE PROFILE MILLING OPERATIONS

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THIS JOB IS COMPLETELY AUTOMATIC

This *Automatic* Milling and Indexing job was accomplished with a standard Gorton Pantograph with special fixtures—just one of many possibilities of tracer control milling.

Gorton Tracer Controlled equipment includes duplicators, pantographs and electric arc etchers for milling, engraving, etching and many other metal removal operations. This equipment provides high spindle speeds, wide versatility and high precision—characteristics for which Gorton has been known for more than fifty years. It will pay you to investigate Gorton Tracer Control methods now.

Standard Gorton Tracer Controlled 3-U Pantograph with special fixtures profiles turbine impeller blades in one *completely automatic cycle*

THE JOB IN BRIEF

1¾" O. D.

Name of Part—Turbine Impeller (dia. 1¾").
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Machine—Gorton Tracer Controlled 3-U Pantograph with special fixtures.
Operation—Mill 30 impeller blades in machined aluminum alloy blank with completely automatic feed and indexing.
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Cutting Tools—.038" single flute cutter.
Remarks—Shape of cut determined by motorized master which drives the tracing stylus. Feed of cutter governed by special cam interlocked with indexing arrangement.

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1A

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3. You can order them on a rental basis ... delivered at any time convenient to you—at *regular* intervals.

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5. *Every* KEX Industrial Towel has been chemically cleaned and is individually inspected before it is sent to you.

No wonder KEX Industrial Towels are used by many of the nation's leading manufacturing plants. These companies have found them more efficient, more economical and *safer* than ordinary rags.

Rent KEX Industrial Wiping Towels and figure your savings! Nothing to buy—no expensive inventory—just a low monthly rental. The first month you use this service should show a decided saving on wiping costs.

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man privately and to cope with him as an individual than it is to try to make all employees fall into the same general pattern.

Think twice and save your top is an effective slogan for any supervisor.

Charles D. Townsend
Centralia, Mo.

•

WORK THE RULES—OR RULE THE WORKS?

The best-managed organizations have few standing rules; however, those are rigidly enforced.

In a particular company a rule was posted stating certain restrictions, adding that the above rule would be rigidly enforced. This might lead the reader to think taht other rules would be looked upon with less scrutiny and severity.

In any organization there are unusual occurrences which demand speedy decisions by the foreman. They should be given carefully, after all angles have been considered.

Well-defined policies promoting fairness and honesty will usually be sufficient, except in cases where a person feels his treatment has been undeserved. In such cases, he should be free to go to top management if necessary.

John Mark May
Watervliet, N. Y.

•

Men who generally behave themselves on the job resent being reprimanded for some small infraction, even though it is listed in the book. In cases where a rule is broken, it is always advisable to consider the individual as well as the crime.

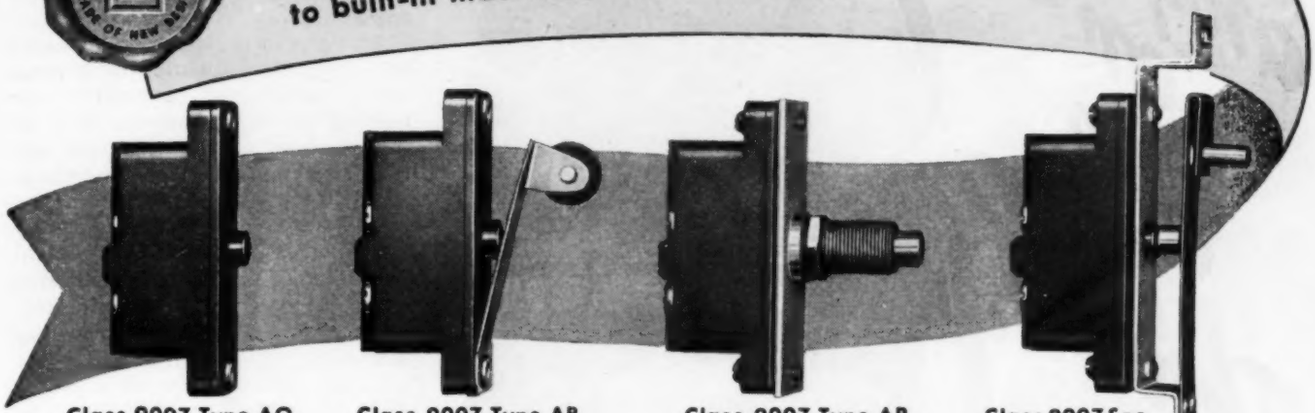
There are usually a few persons in the shop who would like to make their own rules. Because of their length of service they acquire an air of superiority and a feeling that they are above the restrictions laid down by the company in its book of rules. As long as these offenses are not serious, experience has proven that it is best to let them "get away with it" for the sake of getting out the work.

A number of rules usually laid down by most plants, are in a group that should definitely be enforced, regardless of personal feelings or length of service. Such rules may be briefly outlined as: punching the clock at proper times; smoking regulations; safety precautions; cleaning up ahead of specified times; and dangerous horse-play.

Too many rules, when not confined to the more serious offenses, will tend to cause the employee to feel

Square D offers a Complete Line
OF MACHINE TOOL LIMIT SWITCHES

NEW OPERATORS for Square D's Popular Precision Contact Mechanism extend use to built-in machinery applications



Class 9007 Type AO standard contact mechanism available in several contact and terminal arrangements.

Class 9007 Type AB roller-operated mechanism provides additional over-travel and eliminates side thrust on operating button.

Class 9007 Type AP plunger-operated mechanism has ¾" threaded ferrule for panel mounting, and provides ⅛" additional over-travel.

Class 9007 Special operating mechanism for door switch use— typical of the many special mechanisms that can be designed for a wide variety of built-in applications.

SMALL SIZE with accurate operation, high electrical ratings and long mechanical life— Square D's Class 9007 Type AW precision contact mechanism, built into oil-tight enclosures. Available for either surface or flush mounting, roller or plunger operation, and with a variety of standard and special operating arms.

Class 9007 Type AW

HEAVY DUTY for applications where space is not a factor and service is unusually severe— Square D's Class 9007 Type M contact mechanism in surface mounting, oil-tight enclosures. Threaded conduit hub or back plate opening. Wide range of operating arms including standard and extra over-travel construction, as well as many types of rollers.

Class 9007 Type M

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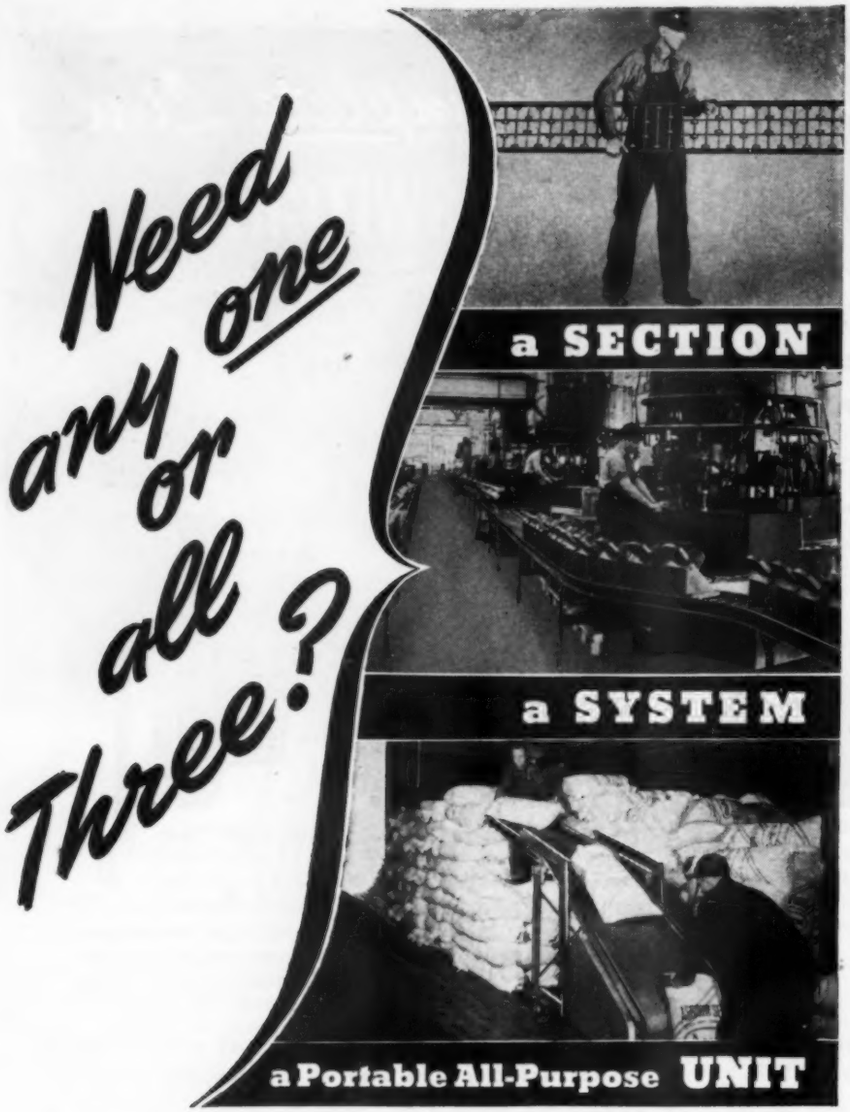

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If you need just a light, portable section of conveyor to speed handling in warehouse or on shipping platform — complete, continuous flow system linking manufacturing or packaging operations — or a portable unit to speed handling in storage and shipping areas — Standard Conveyor Company can supply you with any one or all three.

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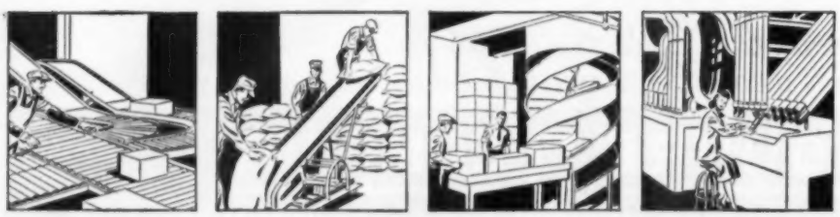

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that he may as well be working in a prison.

An occasional harmless prank, such as the painting of a man's heel with white lead, should not be discouraged. There are countless shop pranks of a harmless nature that when permitted to a reasonable degree will result in a high-spirited group of workers.

New rules appear from time to time, which are usually the result of some costly experience the company has just had. These new rules should be made known to present employees, so that they may not be duplicated.

All types of accidents and dangerous procedures should be brought out in detail, and preventives explained. It often happens that the same type of accident happens time and time again. This knowledge should doubtless prove that employees are not being warned sufficiently. Men in different parts of the plant, but doing similar work, will often learn the hard way—unless the mistakes of others are brought to their attention.

Large plants employing a varied class of workers in different types of work will require a number of rules in order to cover all conditions. To make possible a thorough "Work the Rules" conditions, care should be taken to select rules that are outstanding and which are applied for the benefit of all. If a group of meaningless or childlike rules are incorporated, the employees will obviously attempt to "Rule the Works."

A. F. Scoblic
Milwaukee, Wis.

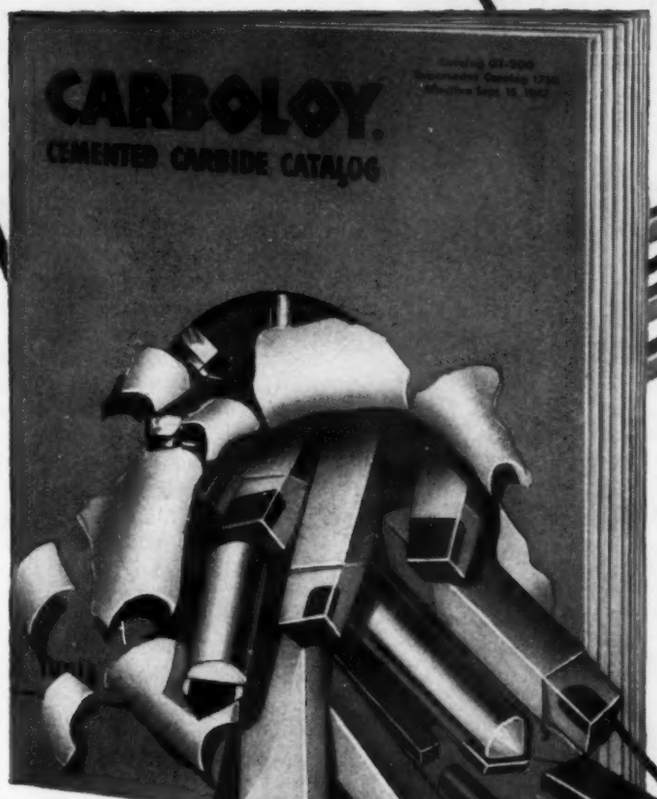
•

Making democracy work lies in the honest application of the principle of "working the rules," not "ruling the works."

When it comes to disciplinary problems, the foreman should not have complete discretion in dealing with violations, but should be governed by the rules and regulations of the company as they apply to certain and definite types of violations. This presents a more equitable manner for solution of specific disciplinary problems.

The mature and efficient foreman recognizes that some violations are unintentional, or when they are intentional, different circumstances call for different penalties. His judgment, if exercised fairly, will earn him the respect of management and labor. Uniform discipline is not always conducive to fairness, but it also can be imagined what would result were each foreman permitted to make his

It's Here! It's New! It's Yours



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Accurate I. D. measurement from 1½" to 40" is simple with the Lufkin Inside Micrometer. Lightweight rods may be added to either end for larger I. D.'s. This means that the micrometer head can be centered for easy reading and to maintain the sensitive balance and feel essential to accuracy. Rods have hardened end caps and are adjustable to compensate for wear. Handle fastens to micrometer head or rods, simplifies accurate use in hard-to-reach applications. Lufkin Inside Micrometers are available in sets. Write for free catalog.

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own rules governing all conditions.

"Work the rules" is a better device for assuring desirable personnel relations than "rule the works" in view of the above conditions.

William E. Kaufman
Philadelphia, Pa.

•

PIECEWORK IN THE TOOLROOM

Around 1907, toolmakers in one of the largest toolrooms in Great Britain complained to the management that they were not making enough money; furthermore, production workers of lesser skills were earning by piecework higher wages than they were receiving, although the toolmakers had a higher hourly rate.

At a conference with the management, the toolmakers' representative suggested all toolmakers be put on piecework for three months. The trial system proved to be a success.

There always has been a reluctant attitude on the part of mechanical engineers and works executives, as well as toolmakers, to consider putting toolrooms on a piecework basis.

Management's reason is that they think the volume of spoilt work would increase, and quality of finish and workmanship would decline due to the toolmaker rushing a job to make his bonus.

Toolmakers argue that you can't put the toolroom on a piecework basis as no one knows in advance how long a tool, jig or fixture will take to complete.

A toolmaker with years of experience is used to making difficult setups and to be right on the dot in checking and measuring; in other words, he is just as much at home in that line of work as the ordinary man on production. The time that he would require to complete a fixture so that it would stand and pass inspection would be adequate if set by a competent rate-setter.

I know from experience that to pay what might appear to be an exorbitant piecework price in a case of a single fixture rather than let the job be done on a daywork basis is more profitable in the long run to management.

Many concerns whose speciality is toolmaking will quote a price for a complete job. If they did not know what the labor cost would be, obviously it would be impossible to quote in competition.

A piecework system incorporating a boss and ratesetter, both skilled all-around toolmakers, would never go back to a straight-time or daywork basis.

Arthur Silvester
Niantic, Conn.

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NEW BOOKS

THE PROBLEM of REDUCING VULNERABILITY TO ATOMIC BOMBS—*By Ansley J. Coale. Published by Princeton University Press, Princeton, N. J. 116 pages Price $2.*

The general impression is that there is no defense against the atomic bomb. This book, prepared under the direction of the Committee on Social and Economic Aspects of Atomic Energy of the Special Science Research Council, will do little to allay that fear. The visualization of the conditions under which atomic war might be waged becomes even more chilling through the cool restraint of Mr. Coale's report.

Two possible conditions are considered. First, war following the breakdown of an effective international agreement, and second, war when there has been no effective agreement and atomic armament is unlimited. These are the extreme conditions that might be encountered and the problem of reducing vulnerability is shown to be almost totally different in the two cases. The author makes no attempt to blueprint methods for reducing vulnerability; it is his intention to explain the nature of the problem, analyze it, and suggest lines of research which should be pursued.

Much in the book is pertinent to the metalworking industry. The problem of maintaining war supplies is second only to maintaining a functioning national administration (not as simple as it might seem when you consider that in Washington one atomic bomb might wipe out the president, cabinet, Congress, military staff, and most key government officials).

The problem is not one to be taken lightly. The officials of any company that contributed to war production in the last war or is likely to be concerned in the unfortunate event of a third world war, would do well to read this book. It gives a lucid account of the danger, summarizes much of the technical data available on the bomb and outlines the research needed. Decisions would have to be made as to whether the needs for a particular item could best be met by stockpiling, by decentralizing or relocation, by moving underground, or by other methods.

But there is a deeper significance to this book for the metalworking reader, as well as for everyone else: The only really effective method of

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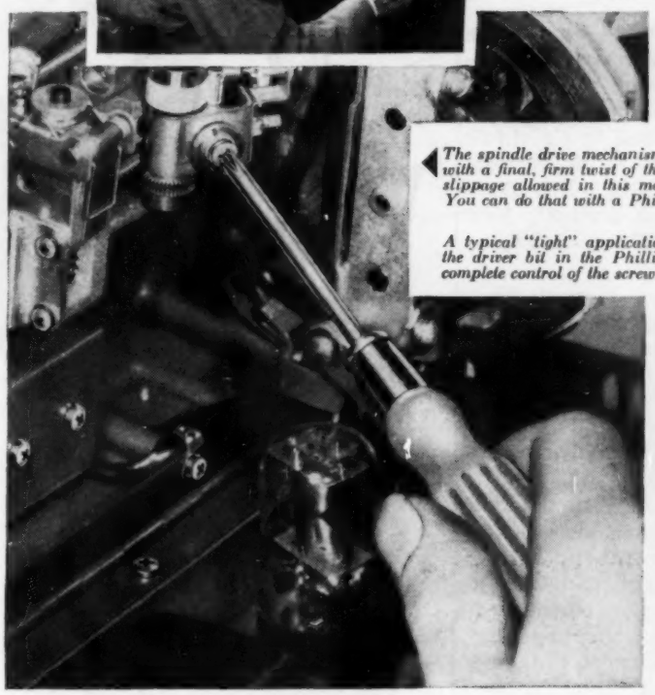
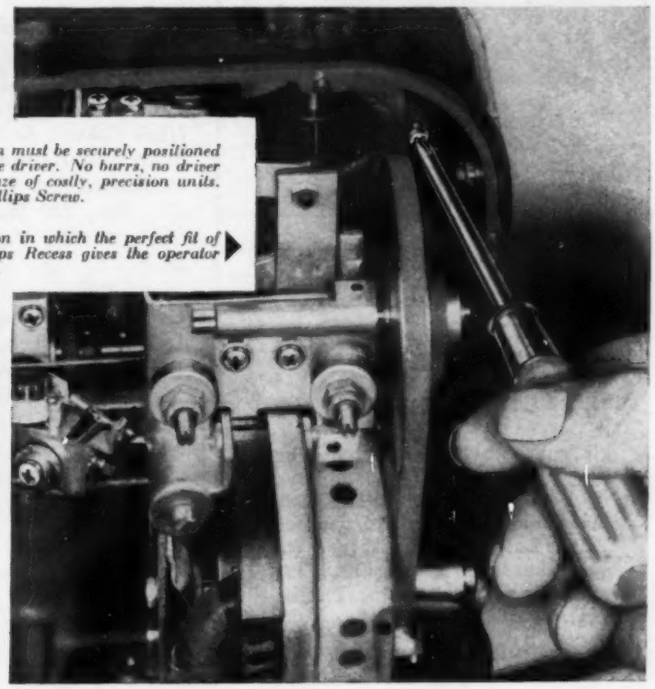


The spindle drive mechanism must be securely positioned with a final, firm twist of the driver. No burrs, no driver slippage allowed in this maze of costly, precision units. You can do that with a Phillips Screw.



A typical "tight" application in which the perfect fit of the driver bit in the Phillips Recess gives the operator complete control of the screw.

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reducing vulnerability to atomic bombs is to effectively prevent their use. That some such means *must* be found is written between every line of this book. It is doubtful if the most effective defensive developments can keep pace with the development of the bomb itself and "unless there is effective restraint on military techniques, there may be no conceivable protection against the materials stored in the arsenals of the world."

•

MATERIALS OF INDUSTRY—*By the late Samuel Foster Mersereau, One-time Chairman, Dept. of Industrial Processes, Brooklyn Technical High School. Revised by Calvin G. Reen and Kenneth L. Holderman. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 623 pages. Price $2.80.*

Fourth edition brings the book up to date to take account of recent developments. It is written to give the student a clear understanding of all important materials of industry and the processes used in their manufacture and distribution.

New illustrations have been added as well as additional material on plywood, plastics, synthetic rubber magnesium and light alloys. Suggestions are made for teachers on room requirements, teaching aids use of films, charts, maps, drawings demonstrations and time requirements. Teaching aids are revised and improved, and a list of correlated visual aids (such as motion pictures and film strips) is provided with each chapter.

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STANDARD COSTS FOR MANUFACTURING—*By Stanley B. Henrici. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. 289 pages. Price $3.50.*

Profits are made primarily through control of costs. No matter how much merchandise is sold, no company can meet competition, and survive, except by eliminating inefficient operation. That is the objective of standard costs by comparing actual costs with standards. These standards, in effect, act as a fixed measure with which cost performance is evaluated.

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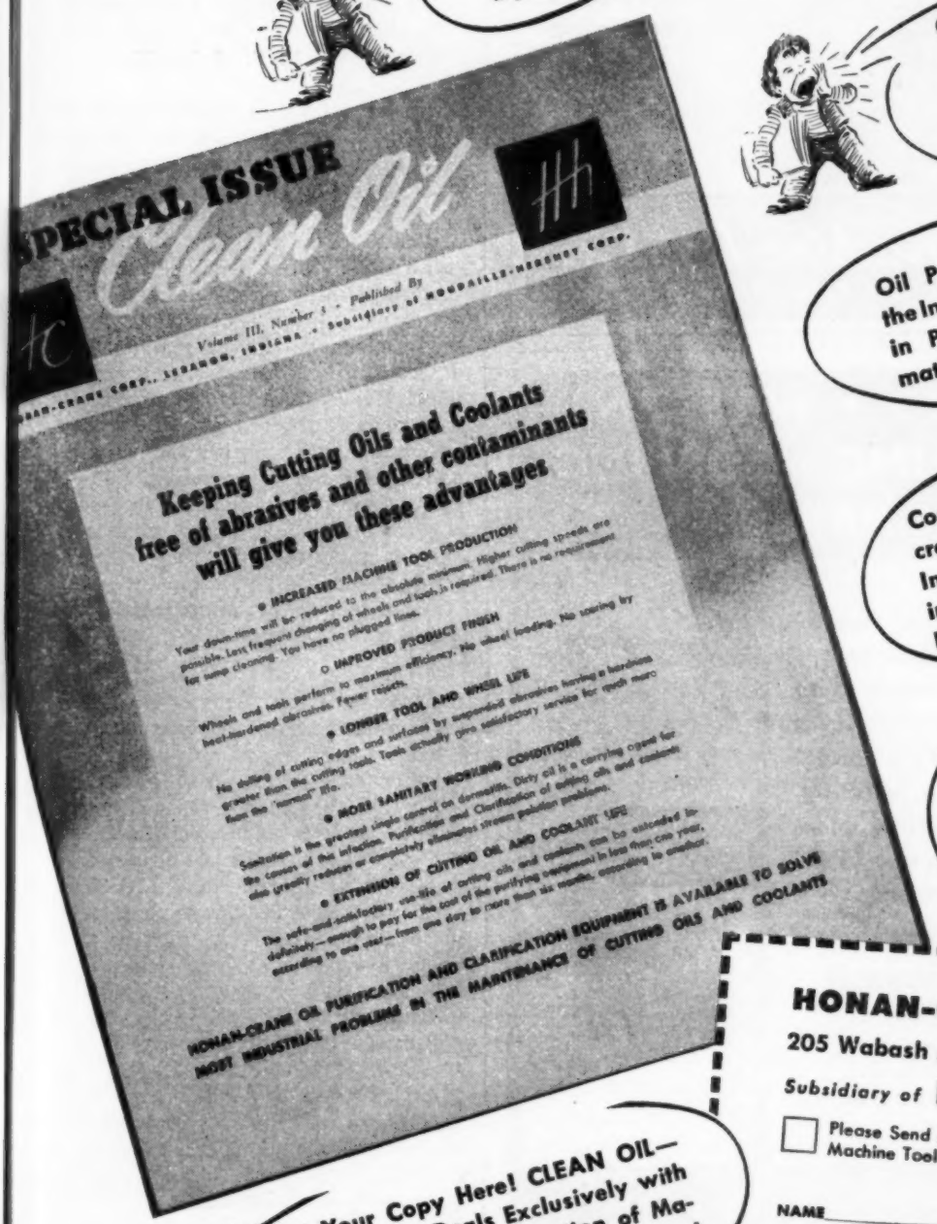
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Volume III, Number 5 • Published By

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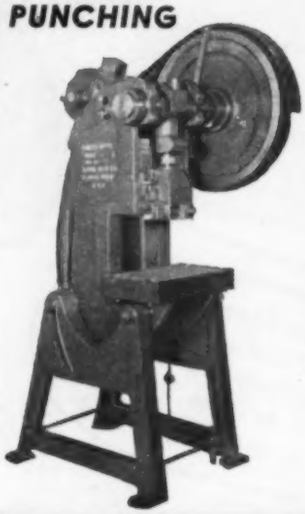

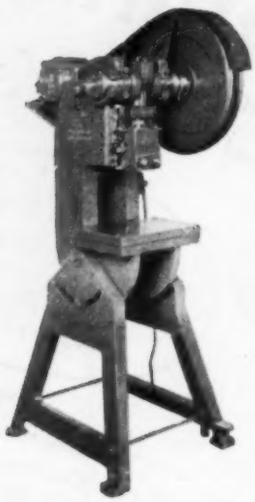

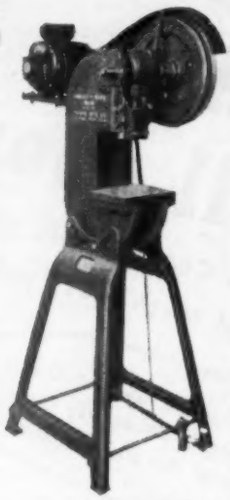

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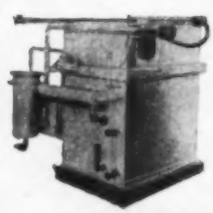

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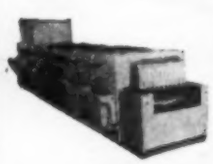

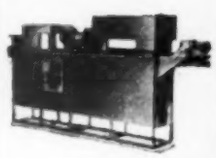

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Variance analysis is treated in considerable detail. A variance in itself is unimportant until it is given meaning. The author does a fine job of giving it meaning in his critical treatment of variances in labor, material and other costs.

As an aid in use of the book as a text, the author has included at the end of each chapter questions and problems, many of which require original thinking to answer or solve.

•

STEEL CASTINGS. *By Eric N. Simons. 216 pages. Published by Chemical Publishing Co., 26 Court St., Brooklyn 2, N. Y. Price $5.*

From 20 years experience as editor of a British publication, the author has assembled much information on steel castings from scattered sources. And he has presented the results of this labor in a style as non-technical as possible for the user of steel castings, students and salesmen. This approach is often a disadvantage to the reader who is seeking definite, detailed information on a specific point. Hence, the chief value of book is to provide the reader with a general acquaintance with the subject and to give him some valuable sidelights from experience. Subjects covered include: raw materials, melting practices, patterns, foundry sands, molds and cores, centrifugal casting, heat-treating, machining, inspection and testing.

•

PRODUCTION WITH SAFETY—*By A. L. Dickie, Supervising Safety Engineer, Travelers Insurance Co. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 242 pages. Price $2.50.*

Accident prevention is approached as a plant investment which results in substantial dollar savings in this book. By realistically portraying a typical safety engineer on the job, it illustrates what each person in a supervisory capacity must do to control accident frequency. Thirteen safety talks serve as a basic course to show how accidents to workers, machines and materials can be controlled. These talks can be used as presented, or adapted to suit any special plant situations that may exist where a safety program is needed.

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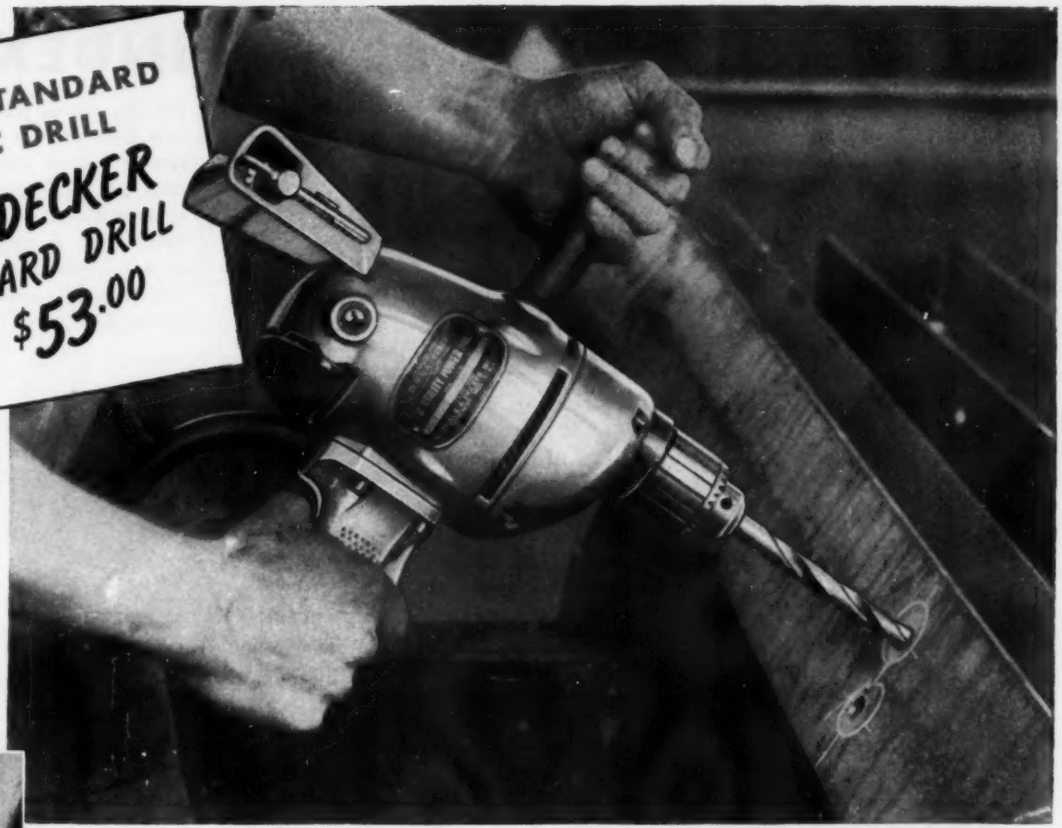

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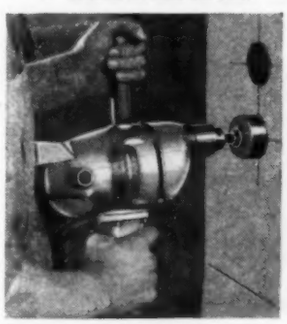

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SEEN and HEARD

By JOHN R. GODFREY

Robot Machine Shops

AUTOMATICITY, or the elimination of manual operations, has a great appeal to some not too familiar with manufacturing processes. A recent article in a widely circulated magazine told at length of the possibilities of manless shops. Each machine was to be operated by remote control from perforated "music" rolls, much as the monotype, type casting and setting machine performs wonders in its line. Large plate punching machines have been operated in the same way for many years. Some of these machines were built by Sellers.

There is no question of possibilities along this line as yet unrealized. But there are reasons. Not all experiments along this line (and there have been many) have paid dividends. Some have been very ingenious, but most have been abandoned sooner or later, or at least have not fulfilled expectations. The main reason has been the overhead cost on such machines, when designs, development and operation have all been considered. Another reason is the difficulty and expense of changes in design of the product. These costs tend to delay changes and improvement, and induce clinging to old designs longer than should be done. Smaller manufacturers with less special automatic machinery can make changes faster and for less money. Even without such highly specialized machine equipment, the large builders of automobiles cannot switch over to more radical designs as rapidly as the smaller concerns. All designers know this is one reason for clinging to outmoded designs.

One reason for enthusiasm for fully automatic machine shops is lack of knowledge as to the part direct labor cost plays in the total cost of a product. While this has increased with the higher wages now in vogue, it is still a much smaller part of the total cost than many imagine. When the initial cost of designing, developing and building robot machines is considered, it will be found that the overhead chargeable against the machine will pay for many hours of labor. Even a minor stoppage for adjust-

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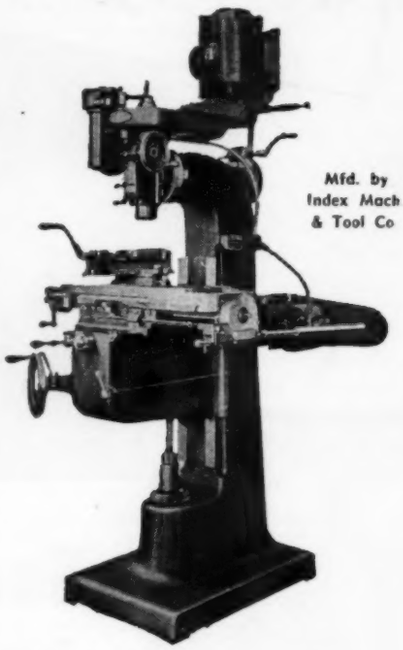
will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request*



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A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

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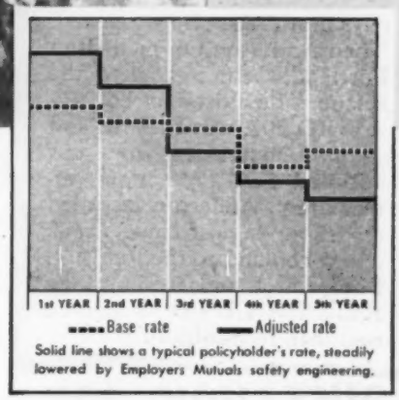

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I OWE THEM TO OUR EMPLOYERS MUTUALS ENGINEER"

Something went wrong. The press ram dropped!

Only by the split-second action of the pull-back guard attached to his wrists were his hands and arms saved from being completely crushed. Emotionally moved, relieved, above all thankful, he kissed the guard that provided protection!

Because an Employers Mutuals Safety Engineer had *spotted* potential danger points and *planned* against them, this man's hands had been saved. Further, *every* worker in that plant had been furnished protection—and the accident loss ratio was cut from 143% to 17% in three years, with a consequent reductionin the plant owner's workmen's compensation insurance premium.

Examples such as this confirm the fact that Employers Mutuals are more than "mutual" in name and policyholder-ownership alone. These are successful, seasoned organizations which respect and understand the widely divergent insurance problems and goals of those whom they protect.

Safety engineering, industrial health programs, accident prevention, prompt adjustment of claims . . . all are included in the many services maintained by Employers Mutuals. Responsibility of service begins the moment your policy is in effect.

You are urged to let your Employers Mutuals man (consult your classified phone book) give you full *understandable* information on Group Disability (Health, Accident, Hospitalization and Surgical Benefits) . . . Workmen's Compensation . . . Public Liability . . . Burglary and Plate Glass . . . Automobile and other casualty insurance . . . Fire . . . Tornado . . . and allied insurance lines. All policies are nonassessable.

A helpful new booklet, "How to Use Employers Mutuals Safety Engineering to Cut Insurance Costs," is yours for the asking.

And, if you request it on your business letterhead, we will include a copy of "A Dictionary of Insurance Terms," a copyrighted book available only from Employers Mutuals of Wausau.

EMPLOYERS MUTUALS OF WAUSAU . . . make insurance understandable

EMPLOYERS MUTUALS OF WAUSAU

EMPLOYERS MUTUAL LIABILITY INSURANCE COMPANY OF WISCONSIN
EMPLOYERS MUTUAL FIRE INSURANCE COMPANY
HOME OFFICE: WAUSAU, WISCONSIN

Offices in Principal Cities—Consult Your Telephone Directory

RUSTAVOID

Saved the day for machine tool builders at Chicago Show

Chicago Sept. 5 — The huge Chicago Dodge plant was the scene of a pre-show crisis. After the modern machine tools had been installed, sludge removed and washed down, bright metal surfaces started to tarnish and rust due to the high humidity. Near panic resulted after months of preparation and but ten days until the show opened. Then Anderson Oil men from Portland, Conn., came to the rescue. Their product, RUSTAVOID 307, was brushed and sprayed on the machines and afforded full protection immediately. Anderson attended the show to introduce Lusol, a new coolant, to the industry. Both Lusol and metal-saving RUSTAVOID received national recognition.

RUSTAVOID 307

FOR SPRAY OR BRUSH
PROTECTS MACHINE TOOLS, PROTECTS WORK IN PROCESS, TRANSPARENT, COLORLESS

FILM THICKNESS .003

MEETS U. S. N. SPECS 52C18 III

WRITE FOR LITERATURE

ANDERSON OIL COMPANY

212 BROWNSTONE AVE.
PORTLAND, CONNECTICUT

ALSO MAKERS OF LUSOL
NEW SENSATIONAL COOLANT

ments, for changing tools or replacement of parts, adds greatly to the total cost of the parts being made. It is these various costs, many of them not fully appreciated in advance, that has led to the slogan that "labor is frequently the cheapest thing in the shop."

There are undoubtedly places for robot machines, possibly for completely robot shops. But they are far less numerous than enthusiasts seem to think. It must also be remembered that we have a far different labor problem than before. Whether we like it or not, there is a firmly fixed idea that men must either have the opportunity to work, or be supported from public funds. The machine age has made the worker dependent on the machine for employment. Even if robot machine shops were economical as producers, they cannot be run without customers. Too widespread application of automaticity can do what machines for so long have been blamed. To sell automobiles, pineapples or flower pots demands customers that are paid to produce them. There are many problems beyond the mere designing and building of robot machines.

TO THE EDITOR

"AN UNSOUND WAGE POLICY" The editorial in June *American Machinist* is so full of meat and especially timely that it prompts me to give you our highest endorsement and to suggest some additional phases.

The so-called "area pattern" used in arriving at wage settlements is likely to be very harmful to both employer and employee as, for example, is the case in our company. Our principal competitors are in communities having lower prevailing wage rates than we.

We have been consistently telling our people that the real pattern is set by our competitors, not by the larger local plant of a national company, with whom we do not compete, but who do largely set the "area pattern" by reason of the fact that they employ nearly half of the people here. We have also been bringing out the fact that we realize our people buy their groceries and live in this community. To some extent the community cost of living should be considered in arriving at a fair wage, but we must also take into account the pattern set by the competitors as you did in comparing Rutland, Vermont, with Detroit, Michigan.

Therefore, we have an incentive plan of operation with profit-sharing bonuses, when and as declared by the Directors, and many other benefits that make it necessary for our people to produce enough to justify the higher wages and benefits they enjoy because we have to get our business in strict competition. We can readily price ourselves out of the market if production is not consistent with wages and benefits.

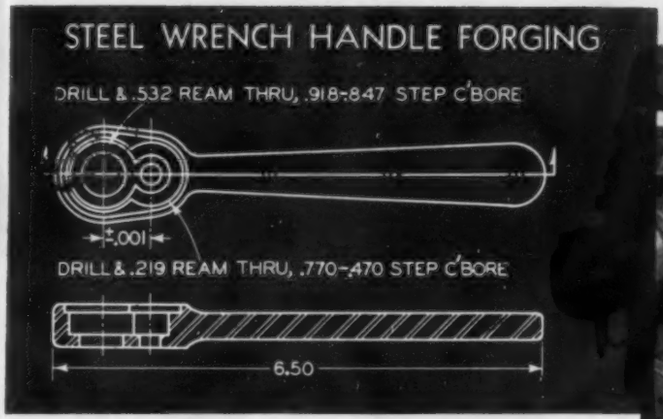
I feel this question of production consistent with pay has not been sufficiently stressed. We have always used the parable of the two P's—Production and Prosperity. You cannot put Prosperity ahead of Production; Production must come first. That is the core of the whole situation today, and unless labor leaders stress this point and eliminate the doctrine of hatred and class distinction, as particularly demonstrated in the terrific and cockeyed pressure in Washington against the Labor Bill, we are not going to get together.

Recently a commentator mentioned that the picture, "Grapes of Wrath," is being shown all over Russia as a horrible standard of the American working people, and a more recent exhibition of a laborer chained with arm and leg irons on a float in a Flag Day procession in Erie, will probably also be used. While these people may or may not be disciples of Communism, they are certainly playing the straight party line right down Uncle Joe Stalin's alley.

I am past seventy years old, have been in industry from machinist apprentice to my present position, and have had unusual opportunities to learn. I feel that unless labor leaders and politicians and industrial leaders sit down and get away from the doctrines of hatred and class distinction, proper reconversion cannot be accomplished so we may continue to enjoy the high standard of living and prosperity to which we are accustomed.

Another angle to consider in this area picture is the matter of taxes, national and state. This affects our state particularly, and does not invite industry. Our own city is now a relatively high-wage town and with a high state tax it does not encourage new industries to settle here.

Name Withheld



PROBLEM Drill, ream and rough and finish counterbore 160 pieces per hour with one operator. Locate the holes within ±0.001.

METHOD Five units work successively on each hole in this sequence: drill, ream, rough counterbore (2 units) and finish step counterbore. Bushings guide the drills, reamers and finish counterbores; the bushing carriers pilot onto the fixtures to align the tools. The rough counterbores are piloted. The work is not disturbed in its fixture until after it is finished.

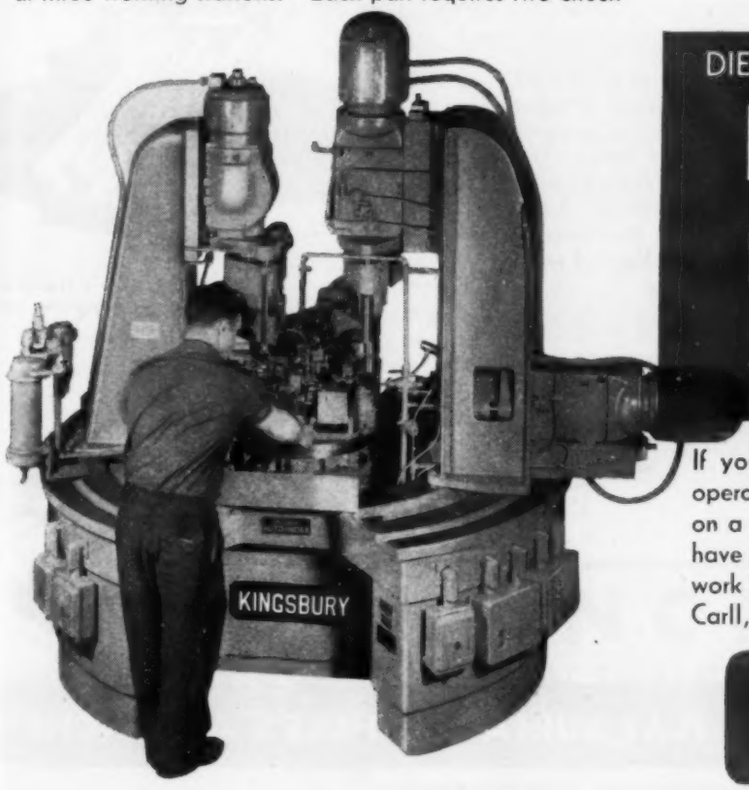
Data: 20 in. power index table, 12 stations, 80 in. base. Gross production 209 pieces per hour.

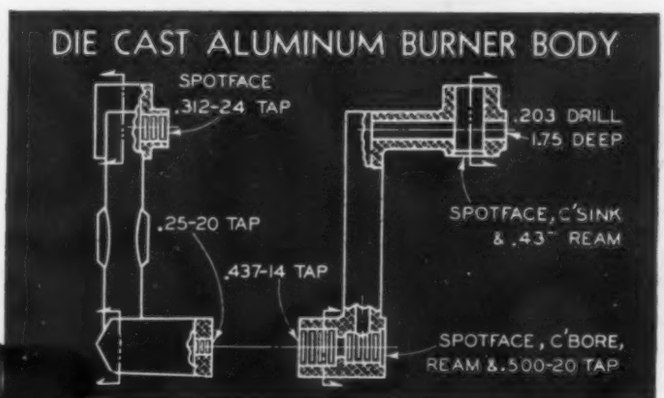
COMBINED OPERATIONS *for* HIGH PRODUCTION

PROBLEM Drill, spotface, countersink, ream, counterbore and tap on four sides at a net rate of 275 pieces per hour with one operator.

METHOD Two horizontal and two vertical units with two-spindle auxiliary heads perform all operations at three working stations. Each part requires two chuckings, so each fixture holds two parts in different positions. In the first chucking, the units perform the four operations at the left of the sketch; in the second chucking they do the operations at the right. Two spindles have combination tools.

Data: 20 in. power index table, 4 stations, 80 in. base. Gross production 352 pieces per hour.





If you have similar problems, send us a print showing operations and required hourly output. We will quote on a completely tooled machine, ready for use. It will have standard units up to 5 hp each and will do accurate work for years at intensive production. Write Mr. L. A. Carll, Kingsbury Machine Tool Corp., Keene, N. H.

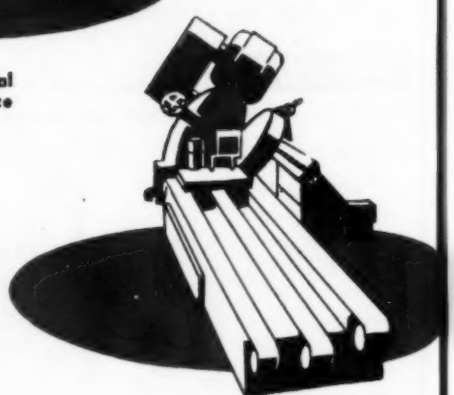
KINGSBURY

It was
A COLOSSAL FIVE RING CIRCUS....
Starring
5 TOP-PERFORMING HANCHETT GRINDERS 5
Special FEATURED ATTRACTION
The Amazing New Hanchett Laminated Magnetic Chucks
HANCHETT
IF IT'S A FLAT SURFACE, THERE'S A HANCHETT TO GRIND IT . . .

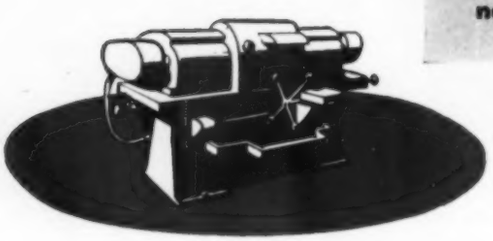
Rotary — General purpose vertical spindle; 1, 2, 3, 4, and 5 head. Automatic vertical spindle.

Reciprocating Table Vertical Spindle; 4 complete size ranges.

Hanchett makes all major types of production grinders — your assurance of impartial recommendations. Capacities from 12" x 36" to 100" dia. rotary. A complete line of Magnetic Chucks.

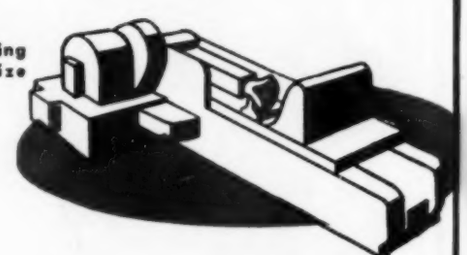


Face Grinders — Traveling Wheel; 3 complete size ranges.



Disc Grinders — Double Spindle Automatic; 7 sizes. Single Spindle; 7 sizes.

Face Grinders — Traveling Table; 5 complete size ranges.



GRINDING by HANCHETT

IF IT'S A FLAT SURFACE — THERE'S A HANCHETT

s a GREAT Show

Now LET'S LOOK AT *Your* PRODUCTION AND COSTS IN THE MONTHS TO COME . . .

The Chicago Show marked the opening of a new era in machine tool design. Henceforth you will have new standards for production in your own plant through the use of such machines as you saw there. At the show, you and thousands of other industrial leaders examined — and compared.

You also had a chance to renew old acquaintances and make new ones, as we did. And, for our part, we were glad to have a chance to talk with you. Your comments and suggestions help us to know your needs better. As a result, we will be able to serve you even more effectively in the months to come.

During these months, the welfare of America — and of your own industry — will depend even more upon *maximum production of goods at ever lower unit costs.* Your best means of achieving that end lies in improved machine tools.

Hanchett, as always, is glad to help you apply high production precision grinding methods in your plant. Installation of Hanchett equipment assures you *more efficient production at less cost.* A letter will bring further information, or a prompt visit from a Hanchett engineer if you wish.

TO GRIND IT

HANCHETT
MANUFACTURING COMPANY
PRODUCTION GRINDING DIVISION
BIG RAPIDS • • • MICHIGAN

FITCHBURG *announces...*

A BASICALLY NEW, MORE PROFITABLE METHOD FOR MASS-PRODUCTION CYLINDRICAL GRINDING

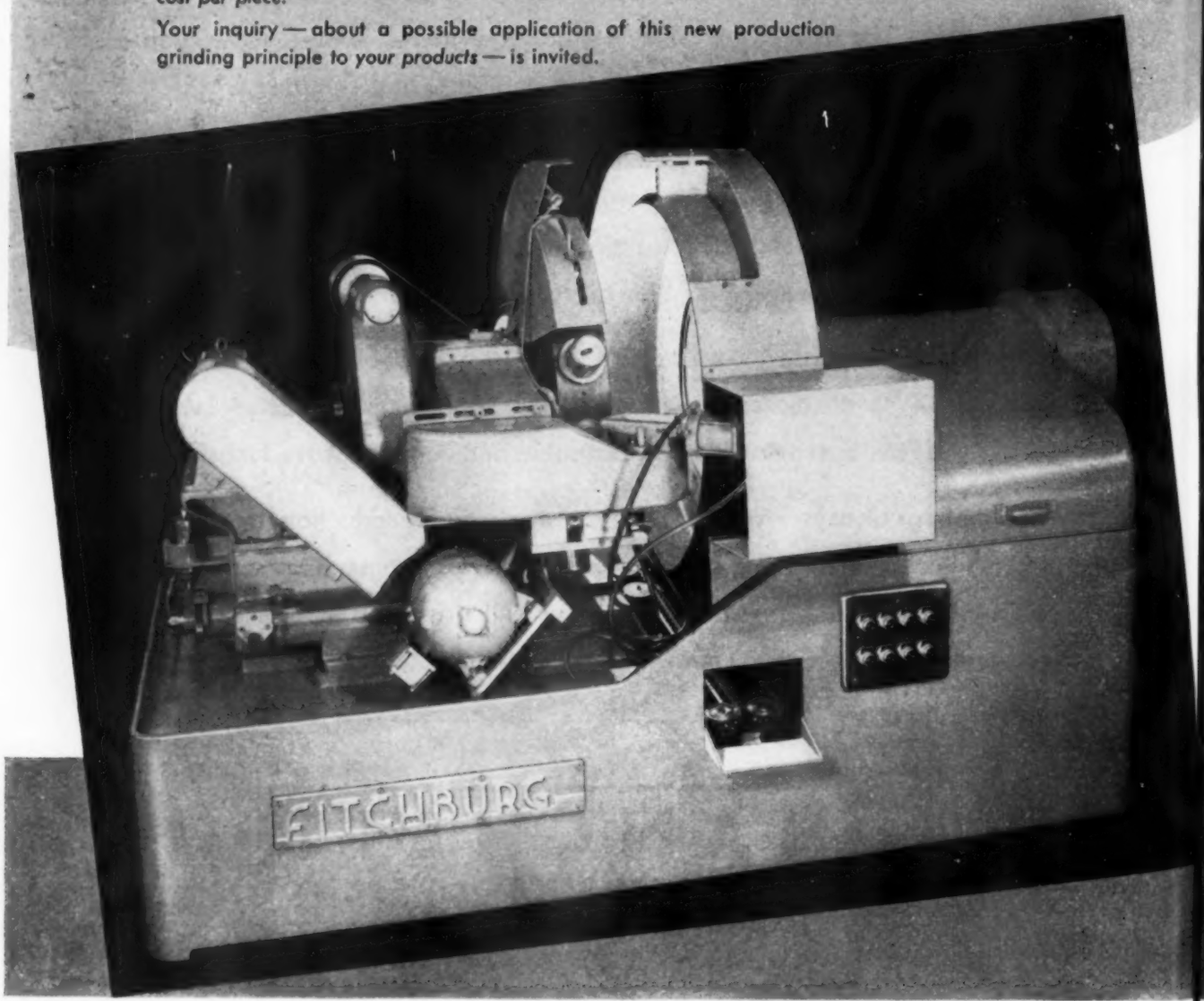
One Grinding Wheel is in CONSTANT CONTACT with *3 or More* Pieces *NO "GRINDING-AIR" TIME LOSS—PRODUCTION IS 4 TO 10 TIMES GREATER!*

FITCHBURG CONSTA-CONTAC GRINDING — the *fully automatic* grinding of several parts at the same time by the use of only one wheel — is the most important advance in mass-production cylindrical grinding since the invention of FITCHBURG'S Automatic Cycle Bowgage Wheelhead.

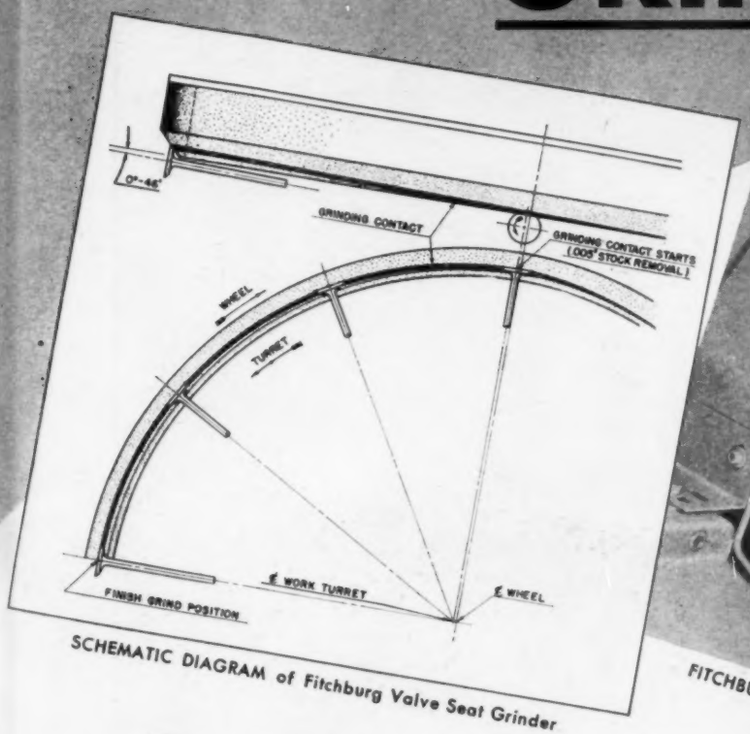
The first application of this revolutionary principle is in the above-illustrated FITCHBURG Consta-Contac Valve Seat Grinder — two of which are soon to be delivered to a top-ranking American automobile manufacturer.

With comparatively small modifications this machine can be used to mass-production-grind practically any part now being cylindrically ground by other methods — *to greatly reduce the grinding cost per piece.*

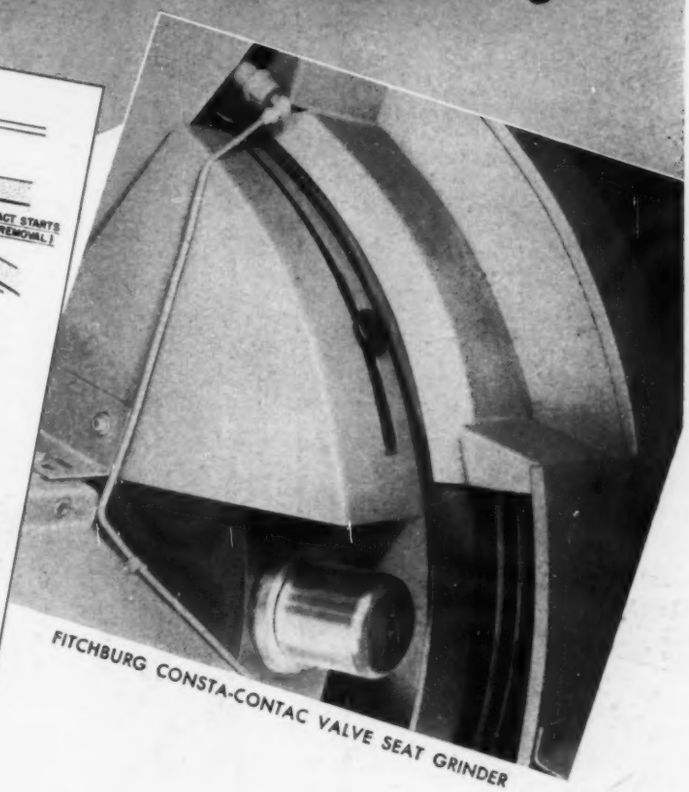
Your inquiry — about a possible application of this new production grinding principle to *your products* — is invited.



...CONSTA-CONTAC GRINDING!



SCHEMATIC DIAGRAM of Fitchburg Valve Seat Grinder



FITCHBURG CONSTA-CONTAC VALVE SEAT GRINDER

Features:

★ No time wasted "grinding air" — 3, 4 or more parts always "sparking" (the greater the stock removal, the more parts are "sparking").

★ Actual sparking time is the same as is possible by any other present method — *but* Fitchburg grinds 3 to 4 pieces in the same elapsed time — *Consta-Contac Grinding is 3 to 4 times faster!*

★ Rotating work pieces can be held either in a chucking device or on short centers.

★ Grinding Wheel can have both a coarse and a fine cutting surface — to take care of both rough and finish grind in one pass.

★ Wheel can be formed to grind several diameters and shoulders — exactly as in present-day formed-wheel grinding.

★ Automatic Truing Device (with self-contained compensation) allows dressing of wheel with only momentary interruption of loading.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

Here's how

Verson

MARK

This huge Verson automatic, transfer feed press performs 5 operations simultaneously on brake drum disks. Stock is fed into the right hand side of the press and formed brake drum disks discharged at the left.

is pushing back the frontiers of metal forming

The origination by Dave and John Verson of the allsteel welded frame over 25 years ago marked the beginning of a new era in the press forming of metals. Using this revolutionary method of construction as the foundation, Verson has led the way in the development of more efficient machines to produce better products faster and at lower unit cost. Completely automatic operation has been combined with ingenious handling methods to permit manufacturing economies never before dreamed possible. We are daily expanding the scope of applications for these modern production methods. Many products which must now be produced individually will soon be made on high production presses at almost unbelievable rates.

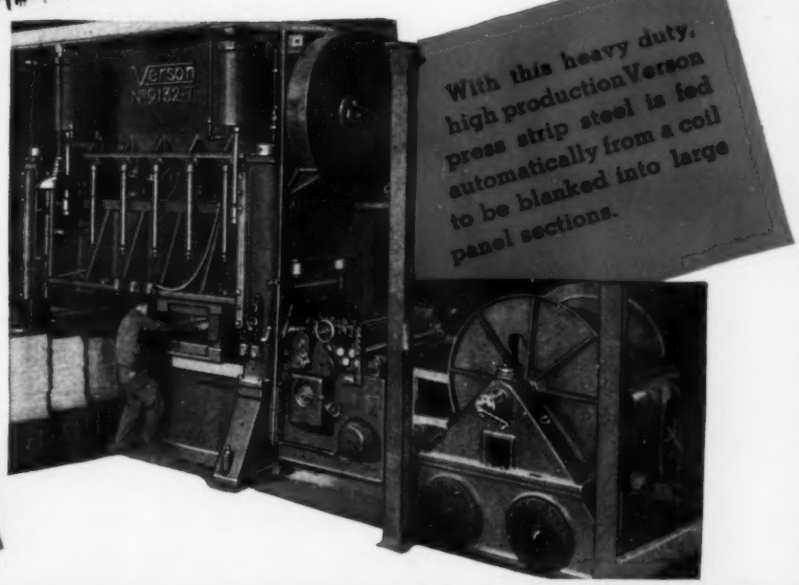
We would welcome the opportunity to discuss your stamping problems with you and show you how high speed methods can be adapted to the manufacture of your product.

MANUFACTURE FOR LESS WITH VERSON EQUIPMENT.

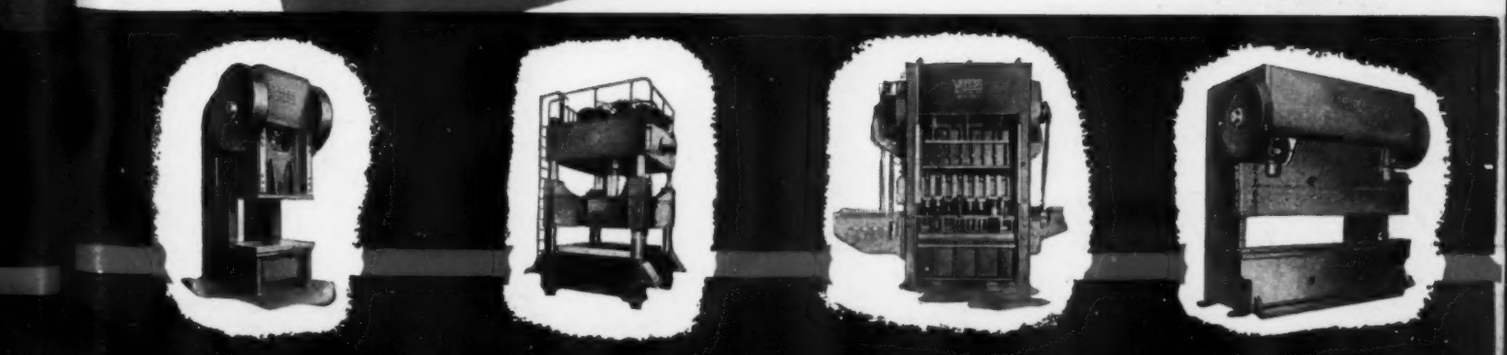
VERSON ALLSTEEL PRESS CO.
9316 S. Kenwood Ave., Chicago, Ill.

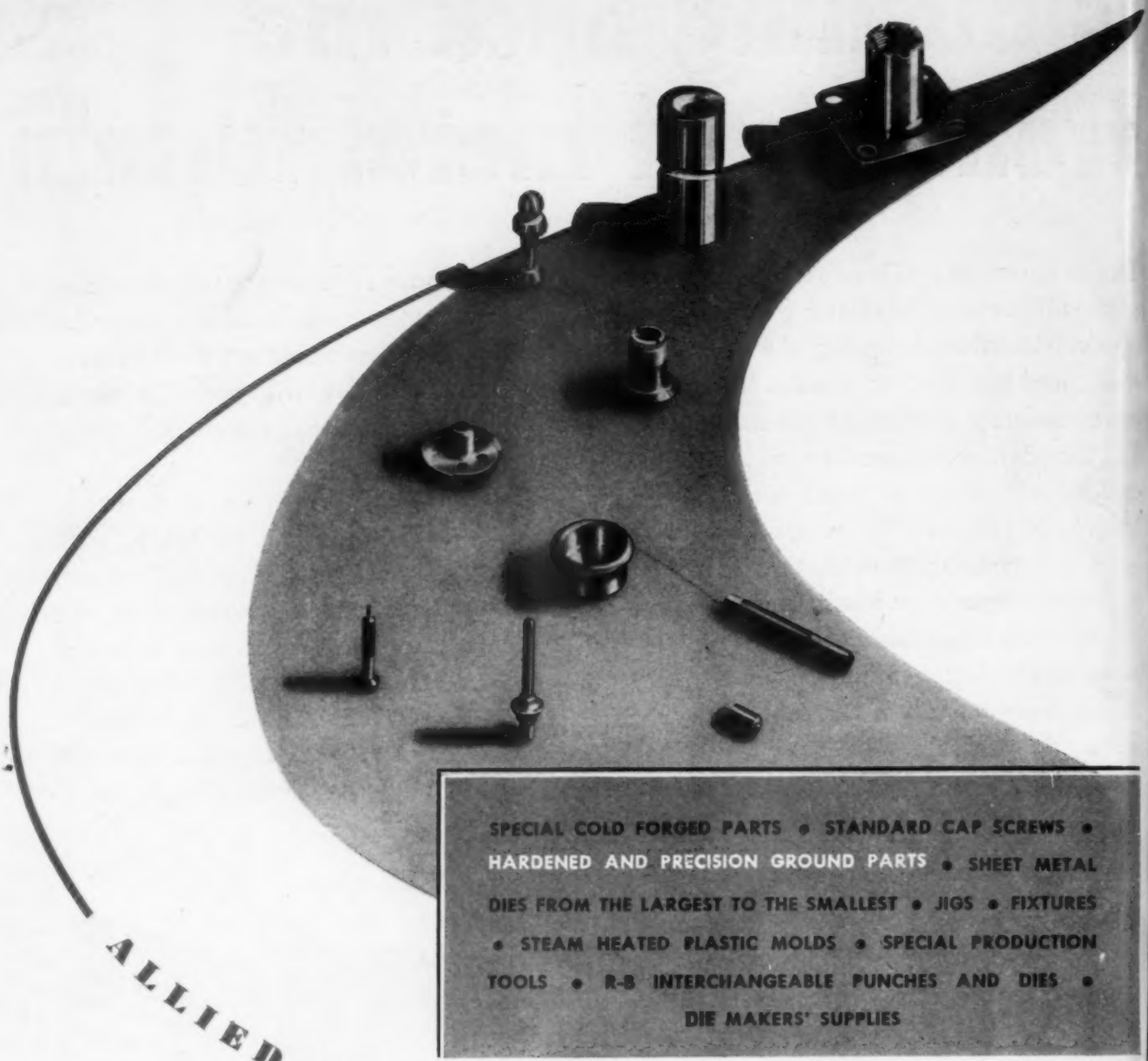
While you're in Chicago for the National Metal Congress, be sure and visit the Verson Plant. We will be pleased to show you the latest developments in high speed metal forming.

These Verson permanently inclined presses have made it possible for a large manufacturer to greatly speed up blanking of motor laminations.



With this heavy duty, high production Verson press strip steel is fed automatically from a coil to be blanked into large panel sections.





SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM HEATED PLASTIC MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

ALLIED WITH MASS PRODUCTION

DO YOU require quantities of hardened and precision ground parts with exceptionally fine surface finish? Allied offers the facilities and experience to produce them for you. You can expect selective hardening and accuracy in grinding to conform exactly to your specifications. Allied's manufacturing capacity assures economical, high volume production and prompt deliveries. Send us your part prints for quotations.

ALLIED PRODUCTS CORPORATION

DEPARTMENT 36

4612 LAWTON AVENUE DETROIT 8, MICHIGAN

ALLIED CORPORATION PRODUCTS — PRECISION · EXPERIENCE · DEPENDABILITY

Made from REVERE TUBE

See REVERE for Tube in

COPPER • COPPER ALLOYS

ALUMINUM • MAGNESIUM • STEEL

(The products illustrated were fabricated from Revere Copper and Copper Alloy Tube, and in some cases from sheet and strip as well)

COPPER REVERE BRASS
Tube is Versatile

. . . RESISTS CORROSION. Revere Copper and Brass Tube have excellent corrosion resistance, which is one, but only one reason why tube of these fine metals is so attractive to industry. Its resistance to most of the corroding factors commonly present in liquids, gases, and air is a big advantage. If your product calls for unusual corrosion-resistance, we can arrange for a Revere Technical Advisor to help you determine the most serviceable alloy for your needs.

. . . IS EASY TO WORK. No matter if your product is simple electrical terminal lugs or complicated oil refining equipment, Copper and Brass Tube simplifies your manufacturing problems. You can easily bend most types of Copper Tube to meet installation needs. If Copper Tube is to be machined, Free-Cutting Copper is preferred. When machining is necessary on Brass Tube, we recommend the use of Leaded Brass Tube for easy and fast cutting. This ease of fabrication speeds up your assembly line.

. . . IS MADE TO CLOSE TOLERANCES. The full wall thicknesses and close gauge tolerances of Revere Tube help to speed up and simplify your manufacturing processes. When you use Yellow Brass or Leaded Brass Tube for machining, you can start with a tube of accurate dimensions and hold to close tolerances at high production speeds because the metal cuts freely and cleanly.

. . . COMES IN SPECIAL SHAPES. In addition to the standard sizes of round tube, Revere Tube can be obtained on order in an almost unlimited variety of profiles—oval, hexagonal, square, or whatever is required. Revere maintains a large stock of different drawing dies and is prepared to make and maintain special dies for individual use.

. . . HAS A LONG LIFE. It gives long service because of its corrosion-resistance and other durability features. You or your mechanics don't have to waste time and money tearing down equipment for complicated repairs and replacements. Consumer products using it enhance your reputation.

. . . REDUCES HEAT LOSS. Copper and Brass Tube carries heated air, liquids, and gases with little heat loss. With Revere Copper Tube for example, the total heat loss due to convection and radiation is about half that for black iron pipe of the same nominal size.

. . . IS A GOOD HEAT CONDUCTOR. Copper Tube transmits heat readily and warms quickly when a warm liquid passes through. This makes fats, grease, and similar substances flow through in a liquid state, reducing any tendency to clog.

. . . REDUCES FLOW RESISTANCE. The smooth gun-barrel interior finish of Revere Copper and Brass Tube allows liquids to flow through it rapidly with minimum friction. When solder fittings are used, there are no projections or recesses to obstruct the flow.

. . . IS AN IDEAL ELECTRICAL CONDUCTOR. High electrical conductivity is especially important to the electrical equipment manufacturer. Revere Deoxidized Copper Tube has a rating of 75-90 per cent. I. A. C. S. electrical conductivity at 68° F., Cartridge Brass Tube has a rating of 28 per cent, and Leaded Brass has a rating of 26 per cent.

. . . REQUIRES LITTLE FINISHING. This tube has a smooth, attractive finish. When it is made into manufactured articles, this reduces polishing and buffing time.

. . . IS EASY TO SOLDER OR WELD. You can solder, weld, or braze Copper and Brass Tube rapidly and economically.

. . . IS EASY TO PLATE. You save money when you make plated parts from Copper and Brass Tube. It is a simple matter to plate the tube with chromium, nickel, silver, gold, rhodium, and many other metals. It is equally simple to apply other finishes, such as paint and lacquer.

. . . IS ECONOMICAL. The ease with which Revere Tube can be made into finished products results in economical manufacture. The user enjoys the ultimate economy of having a long-lived article requiring a minimum of maintenance, which adds to your reputation as a maker of fine goods.

. . . HAS HIGH SCRAP VALUE. Nearly any kind of scrap you make during fabrication of Copper or Brass Tube has a market value. About the only exceptions are filings and dust. Likewise, if you scrap part or all of a Copper or Brass Tube installation due to obsolescence for example, you can realize a favorable return on the metal. These economies are highly appreciated by all experienced users of copper and brass.

THE BIGGEST ADVANTAGE OF ALL IS SUPERIOR QUALITY

The word Revere on a length of Copper or Brass Tube has long been a guarantee of the ultimate in high quality. Generations of manufacturing experience, plus modern production methods, strict metallurgical controls, and frequent inspections ensure that every foot of Revere Tube conforms to the same exacting standards.

THESE THREE ALLOYS MEET MOST MANUFACTURING REQUIREMENTS

REVERE COPPER TUBE— Alloy No. 101 (Deoxidized Copper) (Copper 99.90% minimum, phosphorus 0.025%).

General properties: Revere Deoxidized Copper is extremely corrosion-resistant, has high ductility, welds and solders readily. It is furnished in hard or soft tempers.

Typical uses: Revere Copper Tube is recommended for industrial piping of liquids; compressed air, gas, and refrigeration lines; feed lines and piping in electric power and light plants; locomotive water systems; automobile radiators, heaters, oil lines, brake systems, and gasoline lines.

Working properties: Cold working, hot working, soldering, polishing—excellent. Machining—Free-Cutting Copper preferred. Welding—gas, carbon arc, and metal arc.

ASTM specifications: B13, B42, B68, B75, B88, B111.

REVERE CARTRIDGE BRASS TUBE — Alloy No. 161 (Copper 70%, zinc 30%).

General properties: This is the metal used for shell cases and cartridges in the war. It has the best combination of ductility and strength of all the brasses and consequently it has superior cold working properties. It is hard drawn, stress relieved.

Typical uses: Revere Cartridge Brass Tube is recommended for automobile windshield wipers, warp bars or beams in textile machinery, plumbers' brass goods, fire-fighting equipment, toys, automatic pencils, fishing tackle, vacuum cleaners, electric fixtures.

Working properties: Cold working, soldering, polishing — excellent. Hot working — good. Machining—Leaded Brass recommended. Welding—gas, carbon arc, metal arc, spot and seam welding for thin gauge.

ASTM specifications: B135 No. 2.

REVERE HIGH-LEADED BRASS TUBE— Alloy No. 222 (Copper 67.0%, zinc 31.4%, lead 1.6%).

General properties: Free machining combined with moderate cold-forming ability. It is hard drawn, stress relieved.

Typical uses: Screw machine parts, electrical fuse parts, manufactured articles requiring machining or threading.

Working properties: Cold working—fair. Hot working—poor. Machining—good. Welding—non-leaded brass preferred. Soldering—excellent. Polishing—excellent.

ASTM specifications: B135 No. 4.

REVERE Tube is also made in these metals—Electrolytic Copper, Free-Cutting Copper, Silver-Bearing Copper, Arsenical Copper, Oxygen-Free Copper, Red-Brass, 85%, Muntz Metal, Admiralty Metal, Aluminum Alloys, Magnesium Alloys.

LOCKSEAM TUBE

Revere can supply Lockseam Tube in a wide range of shapes and sizes, and in practically all commercial metals. This tube is extensively used for automotive radiators, casket and grave vault handles, appliance and implement handles, light structural applications, electrical apparatus, and for ornamental purposes.

ELECTRIC WELDED STEEL TUBE

Revere also makes Electric Welded Steel Tube, widely used in the manufacture of parts and products not requiring the high corrosion resistance of copper and its alloys. This tube is supplied in round, square, rectangular, oval, and in special shapes to your designs. It may of course be bent, flanged, rolled, machined and otherwise worked, and can be polished, plated, enameled or painted.

ALUMINUM TUBE

Revere Aluminum Tube is used for furniture, hand and stair rails, for conducting liquids and gases, for refrigeration, and wherever a lightweight, strong, corrosion-resistant tube is needed. Available in 2S, 3S, 4S, 24S, 52S and 61S alloys; 24S and 61S can be furnished either soft or heat-treated; the others annealed or in various tempers.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

•

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

Which Coupling Shall I Use?

Here are four types of BOSTON couplings suitable for a wide range of applications from "flea" power up to 100 horsepower—available in 69 different stock sizes!

1 This is what is known as the Renold-Hardy flexible coupling and is made up of a flexible disc. of vulcanized rubbered fabric inserted between two metal flanges with hubs. It is available in various sizes capable of transmitting from 1 horsepower up to 100 horsepower.

2 This coupling is known as BOSTON type "FCN"—a three-jaw coupling and is made of a high grade, low carbon content steel with a non-metallic cushion between the jaws to absorb vibration or shocks. It is available in bore sizes ranging from 3/8" to 1½" diameter.

3 This coupling is known as BOSTON type "FA"—a multi-jaw coupling and is made of untreated steel. This coupling is particularly well suited for use with small displays or other light duty applications. It is available in bore sizes ranging from 3/16" to ½" diameter.

4 This coupling is known as BOSTON type "FCB"—a special ball bearing type flexible coupling and is made of case-hardened steel with an insert having hardened and ground steel balls. The greater flexibility of this coupling over an ordinary jaw coupling removes the strain between motor and machine, permitting unrestricted end play of motor shaft. It is available in bore sizes ranging from 3/8" to 1½" diameter.

One of the main features of these couplings is that practically all 69 sizes are carried in stock ready for immediate delivery. Send for your copy of Boston Gear Catalog 54 listing these 69 couplings as well as all other Boston Power Transmission Equipment and Component Machine Parts.

BOSTON GEAR WORKS • INC.

NORTH QUINCY 71, MASSACHUSETTS

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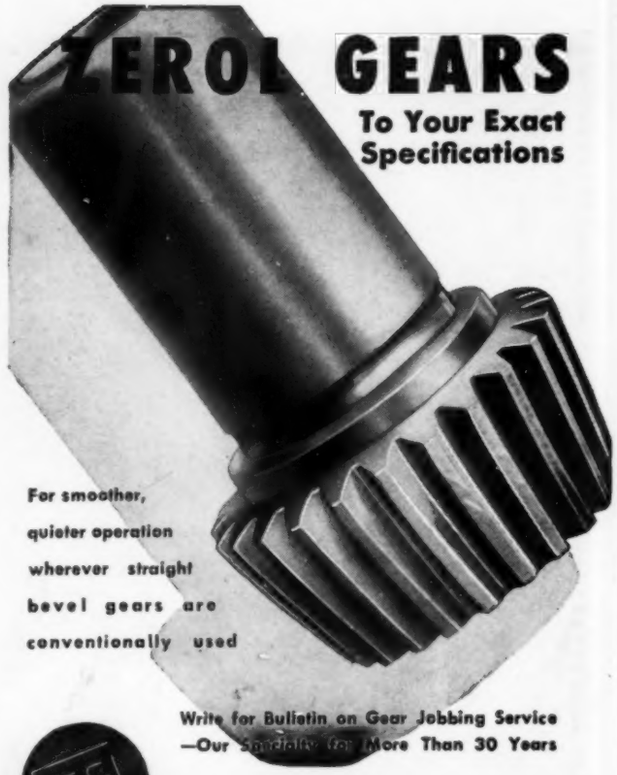

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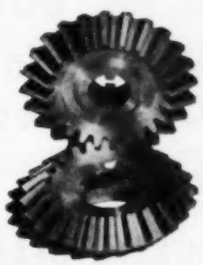

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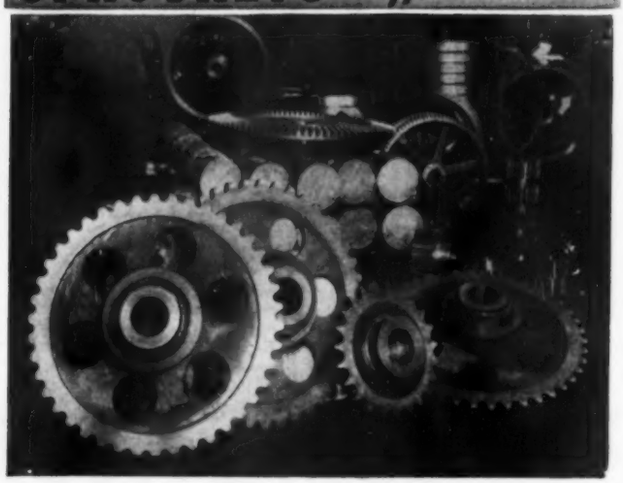

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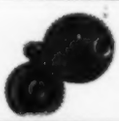

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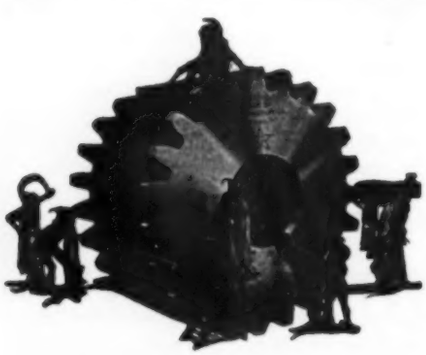

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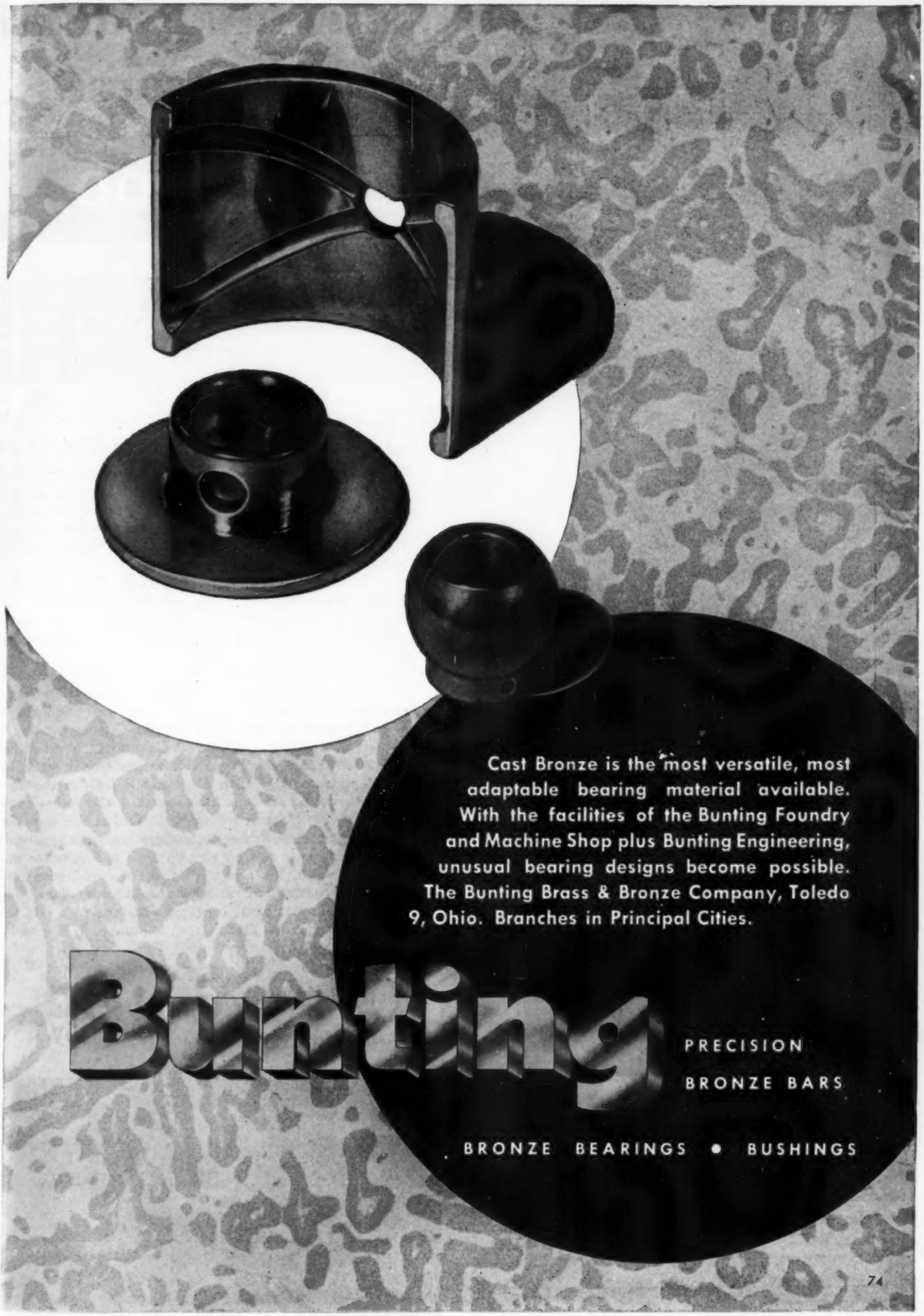
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74

GEAR NEW VERTICAL CYCLEMATI BROACHING MACHINES . . .

Holes broached in valve rocker arms 1200 per hou

17 splines broached in universal joint yokes 500 yokes per hou

Work loaded during broaching stroke.
Automatically positioned, threaded, broached, and ejecte

The *unique* Oilgear Vertical Cyclematic Broaching Machine *high production* unit. Typically, it finish-broaches 17 splin universal joint yokes at the rate of 500 pieces per hour, using 3 it finish-broaches holes in valve rocker arms at an average r 1200 pieces per hour, using 6 tools. These valve rocker arm loaded during the broaching stroke.

Work is loaded at a convenient level. Positioning, threa broaching and ejecting work are entirely automatic. The operations, pilot and control valves and other parts that co and tire the operator are eliminated. Full manual control of the is provided for test and set-up purposes.

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BROACHING MACHINES

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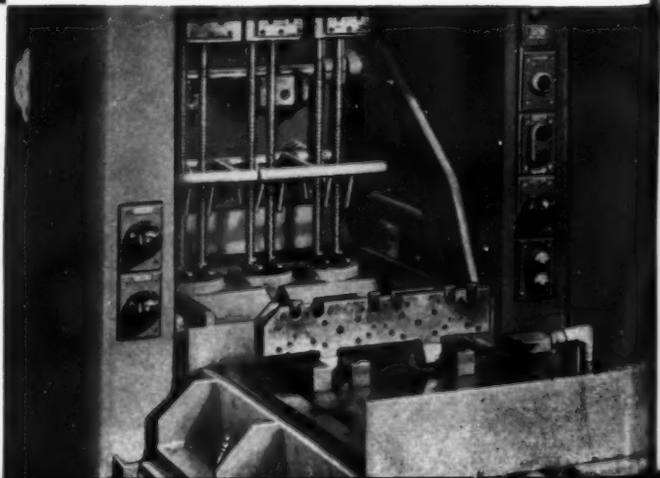
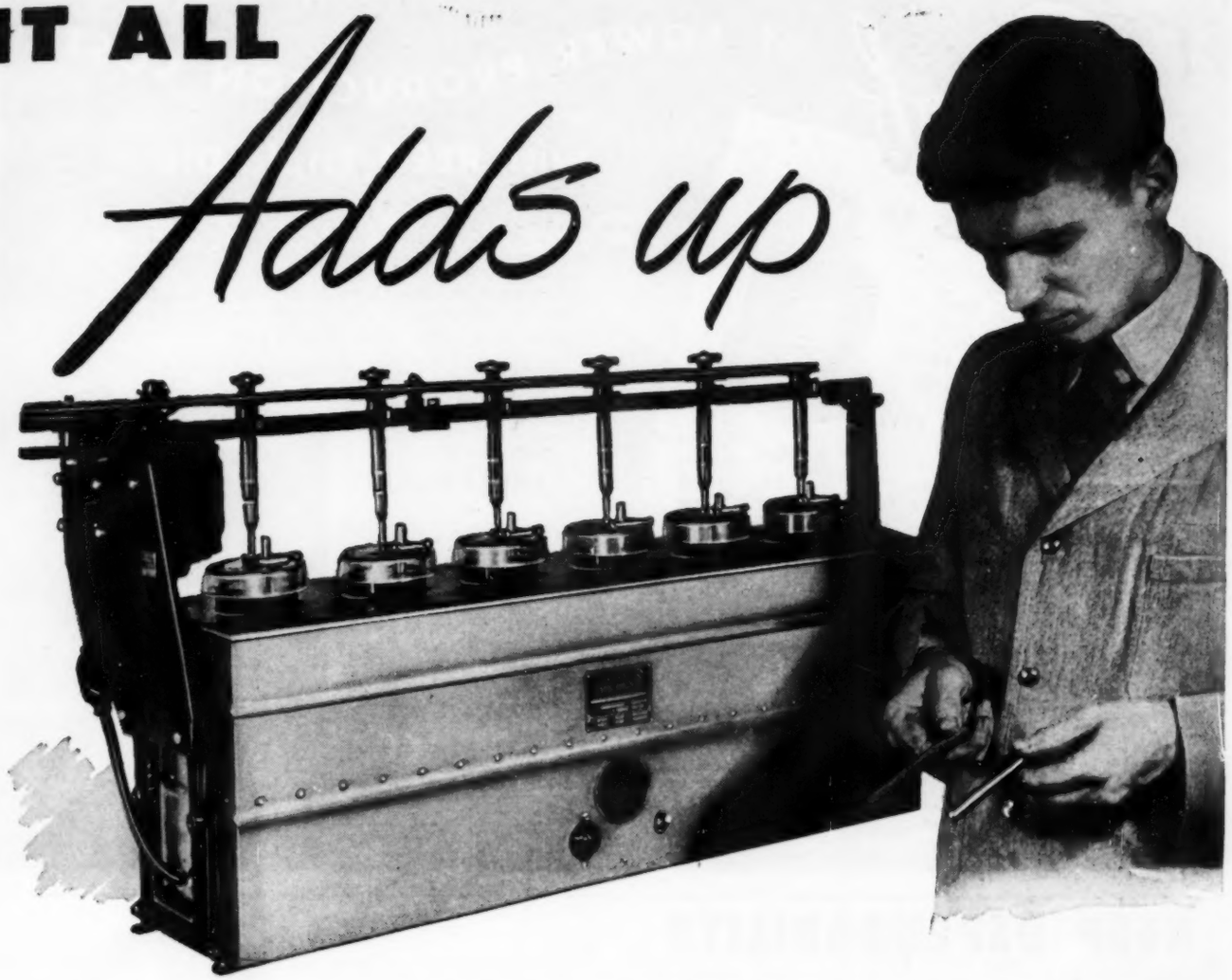


IT ALL *Adds up*



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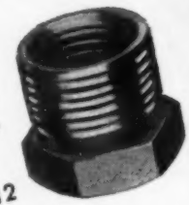

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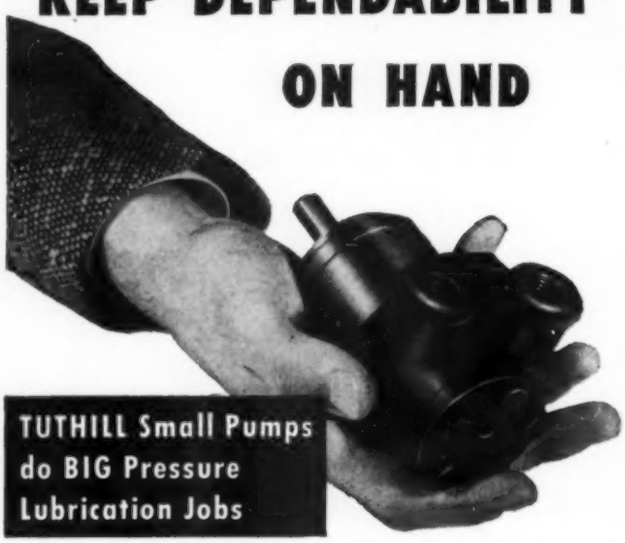

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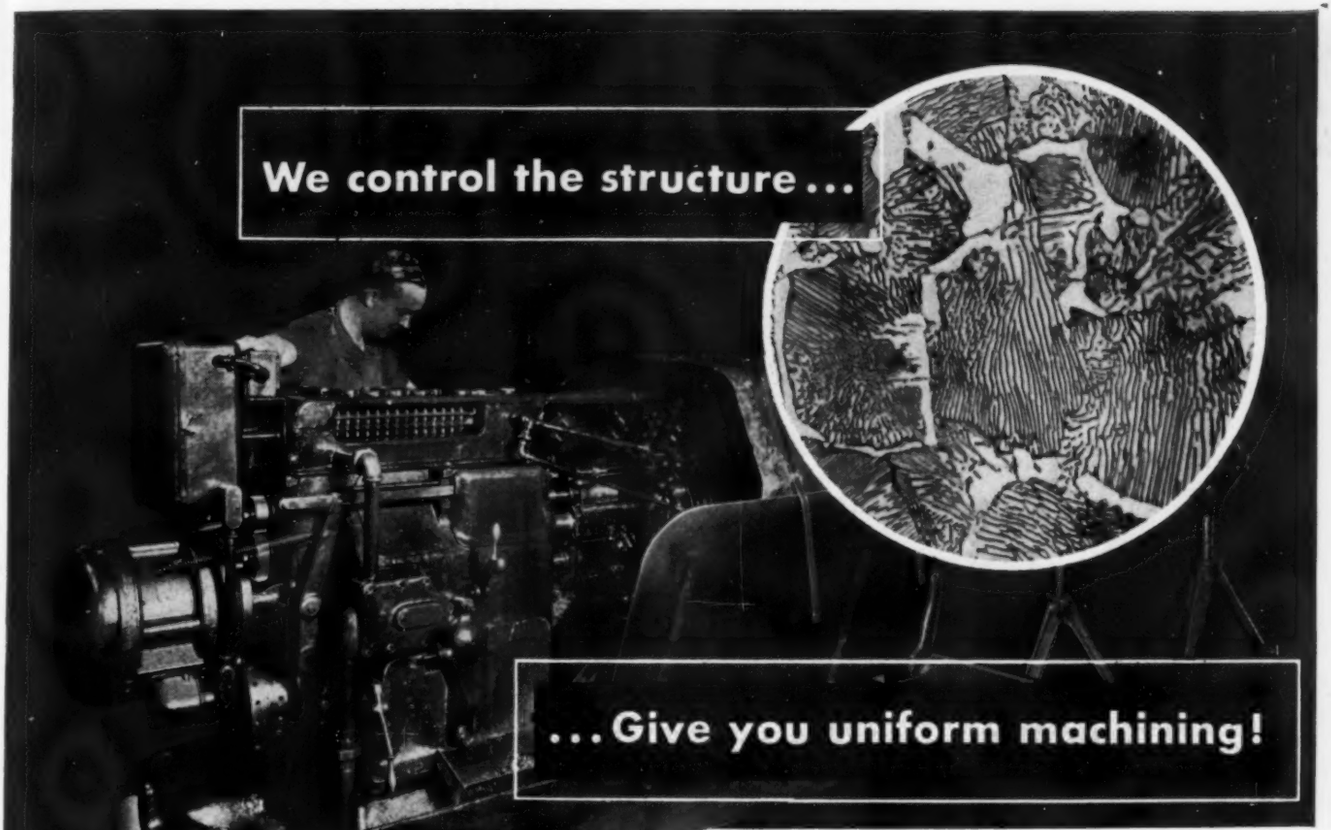

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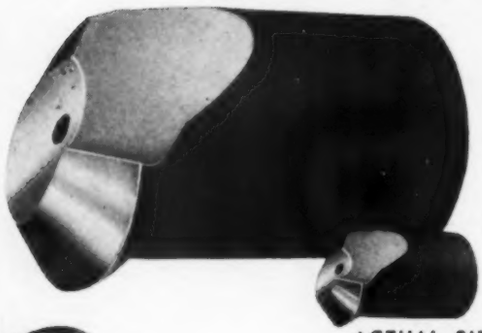

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*

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- Extracts broken cap screws and studs
- Runs wire brushes
- Does hole saw work
- Drills brick and masonry
- Drives wood augers

Uses standard attachments

● What other electric tool would permit you to ream 3/16" of metal from a steel plate held in your hand!

The amazing Ingersoll-Rand Impact Tool (the only universal electric rotary *Impact* Tool in the world) is easy to hold . . . you get no torque reaction—no kick—no twist—under any condition. A patented mechanism converts the power of the electric motor into "rotary impacts" (1900 per minute) which exert a more powerful turning effect than is produced by any other electric tool of comparable size.

AMAZING! — Even if you stall the spindle completely the motor continues to run—no burned out motors when you use the IR Impact Tool.

AMAZING! — You need only one (1) IR Impact Tool and standard attachments to perform all of the operations listed.*

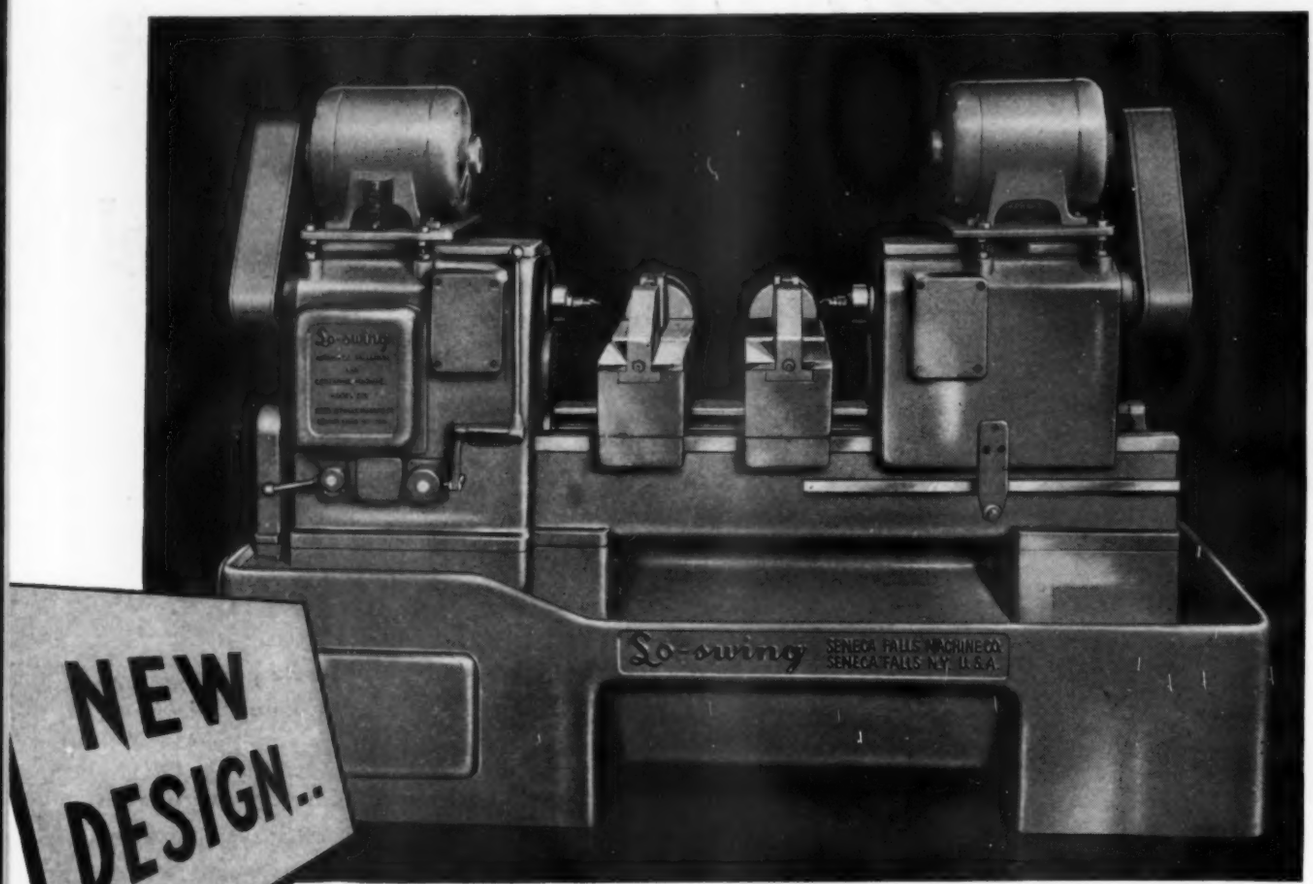
AMAZING! — Delivery from stock . . . See your nearest Jobber or Distributor.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 58-18

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



NEW DESIGN..

AUTOMATIC DRILLING and CENTERING MACHINE has BUILT-IN RAPID TRAVERSE MECHANISM

● We are proud to present the new Model "CS" Automatic Drilling and Centering Machine designed for fast operation on mass production work and equipped with quick change-over features for short-run jobs. Speeds and feeds are quickly changed through the use of standard pick-off gears, and a built-in adjustable rapid traverse mechanism reduces automatic cycle time to a strict minimum.

Two independent, motor-driven heads permit operation at correct spindle speeds for each head when different sized drills or combination countersinks are used. The drilling spindles are cam operated and positive in action. The cams will operate for any depth of cut within the capacity of the machine and do not require changing.

The rapid traverse mechanism for both centering heads is controlled by cams which are pre-set to a graduated dial, doing away with inefficient "set and try" methods.

Standard, quick-acting, equalizing, air-operated vises are available and may be arranged to operate singly or in pairs. Ample distance from the bed to the spindle provides sufficient room for special work-holding fixtures which are available as extra equipment. Electric motors are the standard foot mounting type and may be furnished in sizes from 1 to 3 H. P.

The Model "CS" Automatic Centering Machine is manufactured in four standard sizes, 18″, 42″, 66″ and 90″ between drills. This new addition to the Lo-swing Line of cost-cutting production equipment was shown for the first time at the Chicago Machine Tool Show.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

For those long production runs

NICHOLSON CC

CEMENTED CARBIDE BURS

Where *fast stock removal* and long stretches of *going* are cost-saving factors in rotary filing, Nicholson Cemented Carbide Burs are your tools.

With a hardness that gives them *up to one hundred times the wearing qualities of high speed tool steel,* their seemingly high purchase price is, in fact, proportionately low.

Precision grinding (not hand grinding) contributes to their extraordinary long life. Flutings are absolutely uniform; radius and circumference are faultless. These features assure precision action that permits very high tool speeds—fast, accurate, efficient cutting under pressure so light that chipping or breaking can be held to a minimum.

And here is an additional saving that makes their long-run cost comparatively insignificant: *Nicholson CC Burs can be resharpened and resharpened* —so long as a workable circumference remains. Nicholson offers you this resharpening service at very reasonable cost and with precision standards fully as high as maintained in the original manufacture.

Nicholson CC Burs cut all types of ferrous and non-ferrous metals. Nine standard shapes; 3 degrees of coarseness; ¼" shanks. Consult your industrial distributor. Meantime, *write for prices and descriptive literature.*

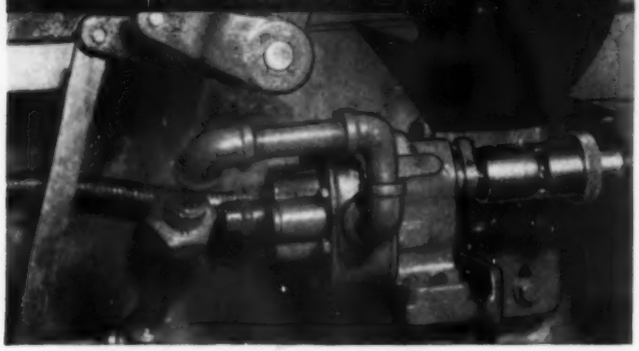
NICHOLSON FILE CO. • 97 ACORN STREET, PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON ROTARY FILES

NICHOLSON U.S.A.

PRECISION GROUND AND HAND CUT • CEMENTED CARBIDE AND HIGH SPEED STEEL

A PLUS FACTOR to consider in selecting PUMPS



Hundreds of pumps like these are in continuous operation in our own plant . . . under the watchful eyes of skilled machine operators, maintenance men, machine designers and engineers as well as pump specialists. Hundreds more are being installed on our new machine tools. Such installations provide practical, first-hand experience for determining the desirable characteristics that pumps require to give *you* satisfactory performance.

FOR COOLANT, GENERAL CIRCULATION AND LOW PRESSURE HYDRAULIC SERVICE, these pumps offer quiet, smooth performance at high speeds. Renewable iron bearings. Mechanical seal . . . prevents leakage and eliminates gland adjustments. Furnished with or without integral relief valves.

Nos. 1-S, 2-S, and 3-S ROTARY GEARED PUMPS with helical gears

FOR HYDRAULIC INSTALLATIONS—to supply oil under pressure. Extremely accurate helical gears run quietly at motor speeds. Although designed for direct drives, can be pulley or gear driven. Mechanical seal. Capacity, G.P.M. at 0 lbs. pressure: No. 53 — 4 to 23.3; No. 55 — 9 to 34.1.

Nos. 53 and 54 ROTARY GEARED PUMPS with roller bearings and helical gears

Write for catalog of complete pump line with detailed specifications and performance charts. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

GEARED • VANE • CENTRIFUGAL • MOTOR DRIVEN

BROWN & SHARPE PUMPS BS

36,000 per hr.

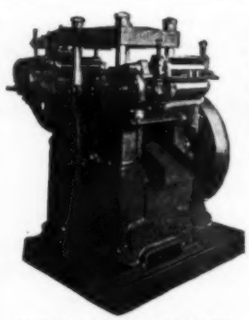
TRANSFORMER LAMINATIONS

Complete-per-Stroke

High Uniformity with Clean, Burr-free Edges

H & W Dieing Machines produce these radio and power transformer laminations COMPLETE-PER-STROKE at rates up to 36,000 per hour, on a high-precision basis:

In the production of transformer laminations of stock from .003" up, and of rotor and stator laminations of silicon steel up to .025", Dieing Machines combine amazing economy with a very high standard of quality. Not only in laminations, but in much more intricate items, the stampings are produced complete-per-stroke at speeds up to 600 s.p.m., with accuracy of product held within .0002" limits where necessary. The unique construction of the Dieing Machine gives greatly increased service from dies, commonly 600% to 1200% over operation or conventional presses. Learn about its "upside down" construction, superior automatic feed and numerous other features. *Request Catalog 47.*



50-TON DIEING MACHINE
Other capacities 10 tons to 300 tons

Pole piece for Diesel engine commutator assembly produced complete one per stroke 120 per minute.

Motor base produced complete one per stroke from 16 gauge steel. Dimensions 6¾"x5"x1¾".

REQUEST ILLUSTRATED CATALOG 47

HENRY & WRIGHT MFG. CO.

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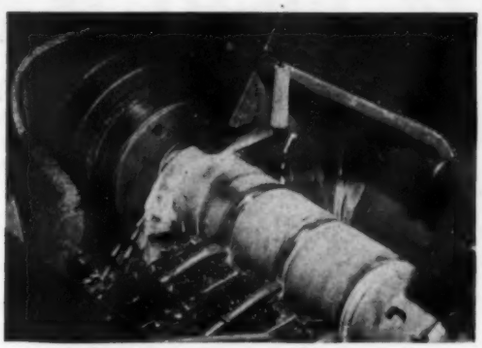
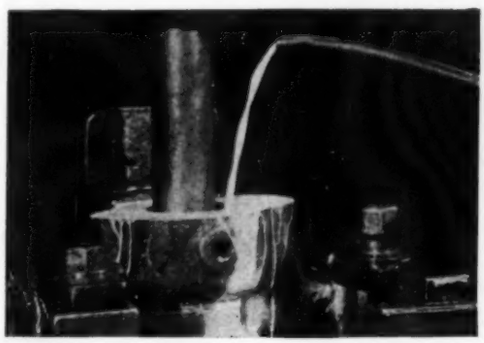
HENRY & WRIGHT DIEING MACHINES

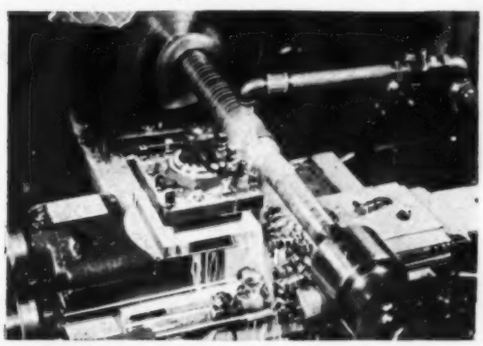
OAKITE SOLUBLE OIL *gives you all* 4...



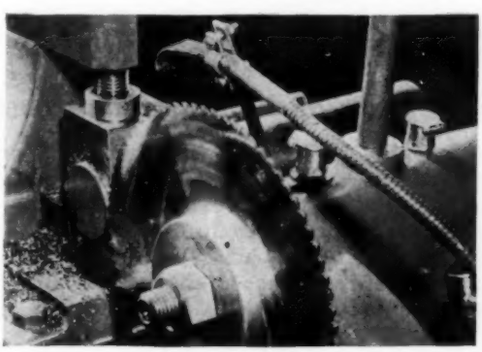
SUPERIOR COOLING Oakite Soluble Oil emulsions rapidly carry off heat. By reducing friction, Oakite emulsions reduce heat; keep work and dies cooler; minimize draw on temper of tool; lessen distortion of work.



BEST LUBRICATION Adequate lubrication of Oakite Soluble Oil acts as a protective cushion in your machining operations. Highly refined Oakite Soluble Oil forms stable lubrication emulsions. Boring (above) depends on such lubrication.



LONG SOLUTION LIFE Emulsions of Oakite Soluble Oil stay workable longer because special ingredients help ward off solution rancidity. That means less danger of dermatitis.



CLEAN CUTTING Rugged cold sawing operations like the one shown above, require the ultimate in cooling and lubrication that Oakite Soluble Oil gives to help your saw make straight, sure cuts.

...plus economy! Make no mistake about it. Oakite Soluble Oil is economical to use because of its high dilution ratio. Add the fact that Oakite emulsions prevent rust, and you have the perfect coolant for all your machining operations. Your local Oakite Technical Service Representative will gladly supply specific formulae designed to give you peak cooling and lubrication for your specific jobs. Contact him today or send for free booklet which outlines formulae.

OAKITE PRODUCTS, INC., 24 Thames St., NEW YORK 6, N. Y
Technical Representatives in Principal Cities of U. S. & Canada

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MATERIALS
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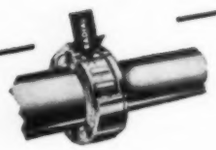
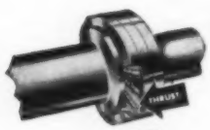
Specialized Industrial Cleaning

Why RIGHT ANGLE LOADING ASSURES LONGER BEARING LIFE

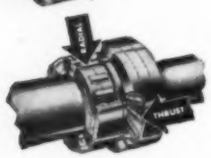
Right Angle Loading splits compound loads into the two component parts of pure radial and pure thrust . . . and carries each of these components on separate bearing assemblies.



- When the load is pure radial, it bears at a right angle to the rollers.



- When the load is pure thrust, it bears at a right angle to the rollers.



- When radial and thrust are combined the two loads are resolved separately at a right angle to the rollers.

ROLLWAY

RIGHT-ANGLE-LOADED BEARINGS

Reduce shut-downs and maintenance costs

They prevent wedging of rollers and pinch-out. Reduce roller end-rub with its wearing friction. Eliminate complicated stresses. Substantially reduce unit pressures. Eliminate compound or oblique loads, and the resultants of oblique loads. Carry greater radial or thrust load capacity in any given dimension. Assure greater resistance to shock loads and vibration. Give longer life expectancy.

FREE SERVICE!

Send us a print or detailed statement of load, speed and operating conditions for free analysis and recommendation. Your information is held confidential.

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DO HARD JOBS THE EASIER WAY...

with Thor

HEAVY-DUTY DRILLS

THOR HEAVY DUTY ½" ELECTRIC DRILL—the original, close-coupled, smaller, lighter half-inch electric drill. No other electric drill of similar size offers such compact power and light weight convenience and high efficiency for continuous service on hard production and maintenance jobs. There's a full range of Thor sizes—*a tool for every need*—all compactly designed, well-balanced and ruggedly built. *For full information ask your nearby Thor Distributor or write for catalog.*

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Thor **PORTABLE POWER TOOLS**

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COMPANY

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NOW GET
EXACT CONCENTRICITY AND PARALLELISM

THE NEW *Bordjaw Chuck* WAY

THE BORDJAW CHUCK is a precise, collet-like work-holder specially designed to simplify and speed the use of the bored-jaw method of holding work on lathes with 1½"-8 spindle threads. It has three *removable, replaceable* and *reusable* jaws which are bored and faced to work-fitting size in lathe on which the part is to be machined:

The cast iron jaws are numbered to insure their accurate replacement when the same job is repeated, or they can be rebored to a larger diameter for new jobs.

OTHER FEATURES:

- Jaws close without any backward or forward motion—thus reference surfaces remain stationary—insuring uniform work lengths.
- Increases collet capacity of small lathes to 2" O.D.—accommodates bar stock up to the diameter of the spindle.
- Holds work *absolutely concentric and parallel*—jaws are bored concentric, and flanges faced parallel in the lathe for each new job.
- Replaces dozens of standard and special collets—saves many hours of special machining—and often eliminates the use of complicated fixtures.

Send the coupon today for the complete details of this new labor and tool saver.

EDWARD BLAKE COMPANY
634 Commonwealth Avenue, Newton Centre 39, Mass.

Please send me full details on the BORDJAW CHUCK—Bulletin 947.

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Now

we are really in the Tubing Business

Tubing has always been a standard product with Ward Steel Co. However it has never had the emphasis that it has today, and will have tomorrow.

A tremendous expansion in tubing inventory coupled with increased cutting facilities and our prompt delivery service gives testimony to our proud boast that we are really in the tubing business in a big way.

Try Ward Steel on your warehouse requirements for seamless steel mechanical tubing.

Rounds ⅛" to 10" diameter available

New General Catalog will be mailed on request.

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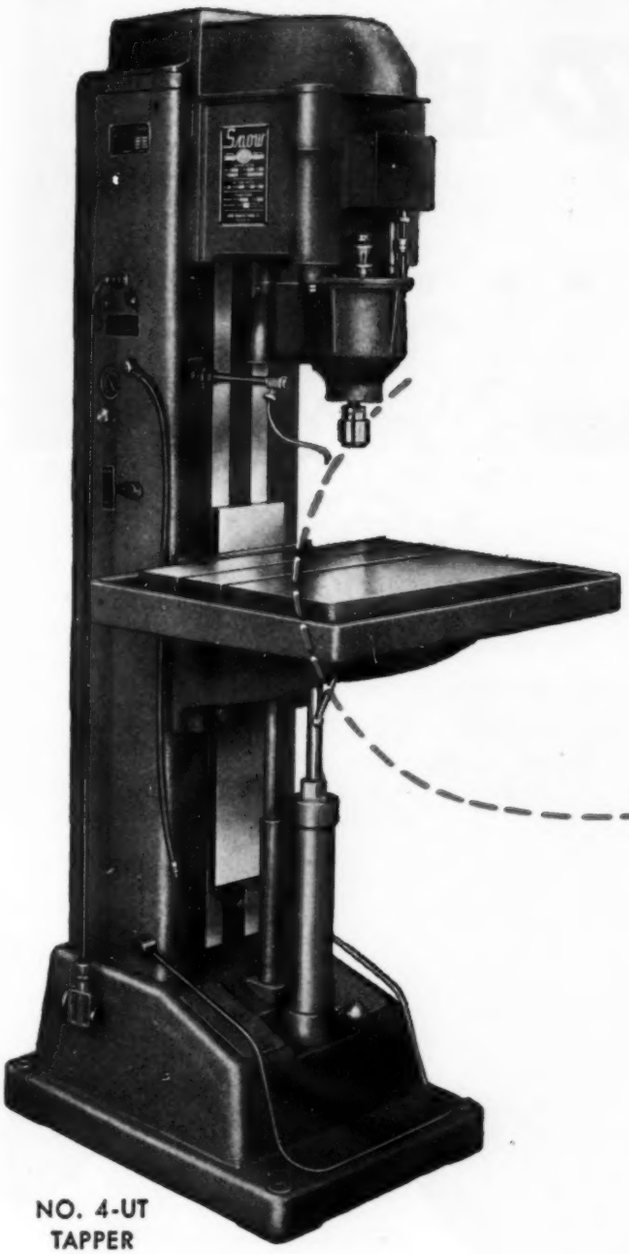
AIR OPERATED • ELECTRICALLY CONTROLLED

FUNCTIONS *three* WAYS



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TAPPER

the *basic* SNOW AIR TOOL

Time-tested, quality-proven, thousands have been put into use in the past sixteen years. The Snow Air Tool — fundamental tool around which are built—the Snow Tapping Machine, the Snow Drilling Machine, the Snow Threading Machine.

Air operated—electrically controlled, it includes the latest in design. Quick-acting automatic holding fixtures are made fully automatic, semi-automatic or manually operated—all by the turn of a switch.

Send prints or sample parts for production estimates and for quotations. Or write for catalog.

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SNOW MANUFACTURING CO.
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CHICAGO 12 • ILLINOIS

WOODWORTH GAGES *ACCEPTED* BY ALL INDUSTRY . . . . . !

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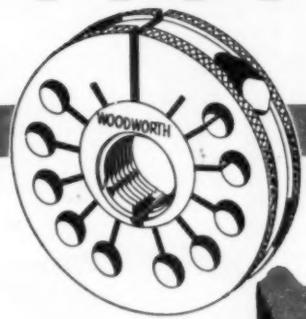

RED—NOT GO

Industry by industry—coast to coast—wherever accuracy and durability count—Woodworth Company is winning and holding new friends—with the *ACCEPTED ADJUSTABLE THREAD RING GAGE.*

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SEND FOR—The new 1948 Woodworth Gage Catalog just off the presses. Requests for copies must be written on company letterheads.

★There's a Woodworth representative near to serve you. Write us for his name.

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COMPLETE LINE OF PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOK JIGS

ONLY A SPRING *can hold it* TIGHT

Everything vibrates

Vibrating things wear loose—especially metal on metal. In your bolted assemblies the nut may never move, but vibration keeps wearing the other parts loose. Bolts stretch; burrs and flares rub down; paint, scale and rust pulverize. Looseness is inevitable—and if there's no spring washer it can be costly.

A strong spring washer expands as initial wear occurs, and it keeps expanding as fast and as far as wear continues—holding all parts tight longer.

Only a strong live spring washer can do this job. There is no substitute.
For real bolted security specify Kantlinks.

Send today for descriptive folders

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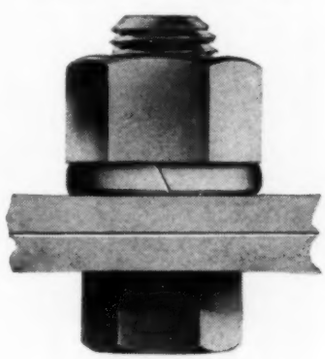

IT'S TIGHT—WRENCHED TIGHT

ORIGINATORS OF
KANTLINK
THE LONG-RANGE SPRING WASHER

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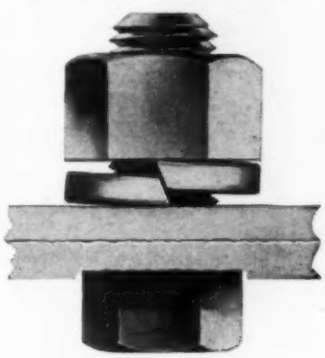

IT'S STILL TIGHT—THE SPRING EXPANDED, HELD ALL PARTS TIGHT

Made to accord with the new ASA specifications

THE NATIONAL LOCK WASHER COMPANY
Newark 5, New Jersey — Milwaukee 2, Wisconsin

THE WAVY SET BLADE

by MILFORD is back again!

Here is a band saw blade of unique design which, on horizontal band saw machines such as Wells, Johnson and Kalamazoo, and on all vertical cut-off machines, will . . .

- • • **increase blade life an average of 30%***
- • • **positively eliminate ripping of teeth**
- • • **cut with greater precision and closer tolerances**

* from actual reports of current users

Originated by MILFORD and discontinued in the interests of standardization during the war. The efficiency of this blade, however, has been so thoroughly demonstrated on the horizontal type of machines now extensively in use, that the 3/4" 10 and 12-tooth wavy set sizes have been added to the standard list and are available for immediate shipment.

Your own machines are your best proving ground. Test a MILFORD WAVY SET BLADE against the field!

Order from your Mill Supply Distributor. He is always ready to serve your needs for all factory and mill supplies as well as MILFORD hack saw and band saw blades.

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PROFILE AND BAND SAW BLADES
PEZISTOR AND DUPLEX HACK SAW BLADES

THE HENRY G. THOMPSON & SON CO.
Saw Specialists Exclusively for Over 65 Years
NEW HAVEN 5, CONNECTICUT U. S. A.

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METAL CUTTING OILS
METAL CLEANERS
RUST PREVENTIVES

Wheelabrator ..... speed cleaning ..... cost reduction proven for FARM IMPLEMENT MANUFACTURERS

The production manager of a well-known concern has this to say about the airless Wheelabrator: "Our work runs from light agricultural castings—1 to 35 pounds—to tractor manifolds and 3 cubic foot cement mixers bowls up to 145 pounds. Average daily heat runs 15 to 18 net tons. Your 48" x 42" Tumblast replaced 3 tumbling mills and the men it would take to operate them. Our casting cleaning costs are now only 1/3 of what they were in former years. Labor costs run as low as $1.75 per net ton." What the airless Wheelabrator has done for others, it can do for you. Ask for a demonstration . . . or write for further information and literature.

Typical Implement foundries using the WHEELABRATOR

International Harvester Co.
The Oliver Corporation
Massey-Harris Co., Ltd.
John Deere Tractor Co.
Allis-Chalmers Mfg. Co.
David Bradley Mfg. Co.
J. I. Case Co.
American Fork & Hoe Co.
Minneapolis-Moline Power Implement Co.
Wood Bros. Thresher Co.

REPORTS FROM USERS

12 Tumbling mills and an airblast room were replaced by an 86" Wheelabrator Swing Table at Western Land Roller Co., Hastings, Nebraska. 10 to 14 tons of grey iron castings are cleaned in from 3 to 8 hours. Typical work, which is completely cleaned in 4 minutes, includes 3' x 4' side frames, irrigation pump castings, feed grinder blowers, turbine pump heads, bowl assemblies, etc.

●

The 48" x 48" Wheelabrator Tumblast at Continental Gin Co., Birmingham, Alabama, cleans the entire daily production in about 2 hours. It previously required 8 hours to clean these castings using 8 tumbling barrels. An average load in the Wheelabrator Tumblast consists of 1400 lbs. of mixed castings, and the cleaning time ranges from 5 to 8 minutes.

American
WHEELABRATOR & EQUIPMENT CORP.
(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)
317 S. Byrkit St. Mishawaka 6, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

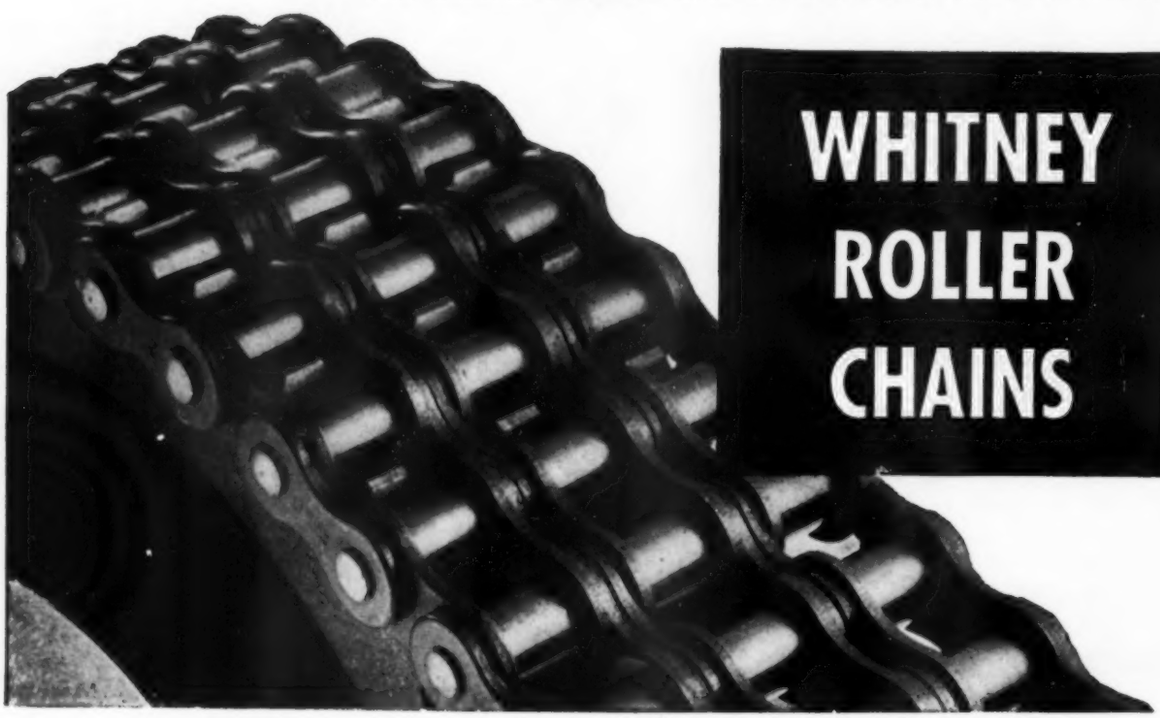
Plan for a DROP in maintenance costs

Maintenance is an important factor, and must be given ample consideration in designing machine drives.

To minimize maintenance costs, choose chains—time-tested Whitney Roller Chains. In most services, the maintenance problem is nothing that just a little oil won't solve.

Parts are durably made—durably assembled—can be relied upon to deliver full-rated machine capacity and to withstand shocks and overloads in hard and continuous service . . . It pays to standardize on Whitney.

THE WHITNEY CHAIN & MFG. CO., HARTFORD 2, CONNECTICUT



COST CUTTING TOOLS

McCROSKY

Block-Type BORING BARS

Ruggedly built for accurate low cost dependable operation

Featuring McCrosky's shop-proved and patented* centralizing V-key construction—conceived, perfected and available only from McCrosky—these block type boring bars will produce more pieces—better—in shorter time.

The cutter block with the oversize blades—each more than half the thickness of the block—is placed in the bar and backed up with a thrust block which is hardened to minimize wear. The individually ground and hardened V-key centers the block and cutting blades, and holds them rigidly. A slight release of the key permits the block to be "floated" with extreme accuracy for making finishing cuts. And further release of the key permits easy and speedy removal of the cutter block, for regrinding the blades, or changing blocks, without removing the V-key from the bar.

McCrosky bars with this exclusive, service-proved and patented construction are available as "Specials" to meet any jig, fixture, or design requirement—see typical illustrations above—or from stock in a wide range of sizes—with straight or tapered shanks—piloted or without pilots—with high speed, cast alloy or carbide tipped blades. Send for Bulletin No. 17-B. It gives full details.

*U. S. Patent 2,021,668

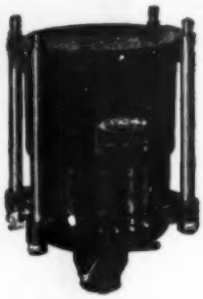
McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock Milling Cutters — *Super Adjustable* Reamers
Block Type Boring Bars — *Turret* Tool Posts
Wizard Quick-Change Chucks — *Special* Multiple Operation Tools

DIECUSHIONS THAT MODERNIZE YOUR DIE CONSTRUCTION AND DESIGN



ADAPTABLE TO ALL DEEP DRAWING PRESS OPERATIONS.

Self-contained unit, quickly installed on any punch press.

Can be used to advantage on pressure pad controls on all forming dies.

DIE CUSHION PISTON DIAMETER						
5"	6"	8"	10"	12"	14"	16"
MAXIMUM DRAW						
2"	2½"	3"	3"	3"	4"	5"
DRAW RING HOLDING PRESSURE (in tons)						
.9	1.4	2.5	3.9	5.7	7.7	10.0

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DAYTON ROGERS
Manufacturing Company
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Not quite yet—but the new Noblewest rapid precision marking machines, like Model No. 194 above, are as modern to marking, as the jet plane to aviation. Whatever you produce in metal—machines, industrial or consumer products—permanent marking is important. But don't let obsolete marking equipment, machines, tools or dies become a bottleneck to production.

Why not let the foremost manufacturer of rapid production marking machines analyze your problems, without obligation to you. Write Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.

MARK IT BEST WITH

NOBLEWEST

Hi-Speed Marking Machines

How to make, read, and apply statistical quality control charts

they mean increased production, higher quality, lower costs — for you

Put these proved methods of statistical quality control to work in your plant or factory—then watch your production increase, your product quality improve, your over-all operating costs reduce. This practical manual helps you gain a speedy mastery of the latest principles and techniques of quality control. It shows you, step-by-step, how to construct and interpret every type of control chart—explains exactly how control charts can be used to build quality into a product during production—demonstrates the many money-saving applications of these charts in a well-organized, non-mathematical manner.

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by ED SMITH

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161 *pages*, 6 *x* 9, 46 *charts and tables*, $3.00

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Designed for actual on-the-job use by busy executives, control engineers, supervisors, and workers at every plant level, the book covers every phase of the development and application of statistical control methods. Based on the famed Shewhart control system, the book presents all the necessary charts, covering both inspection for variables and inspection for attributes. It shows how you can set up and operate an expert system of quality control in your own plant—*with assurance of immediate and tangible results.* Frequency curves—of great importance to the basic understanding of control charts—are fully treated, and their value in interpreting statistical data is clearly explained.

5 how-to-do-it chapters

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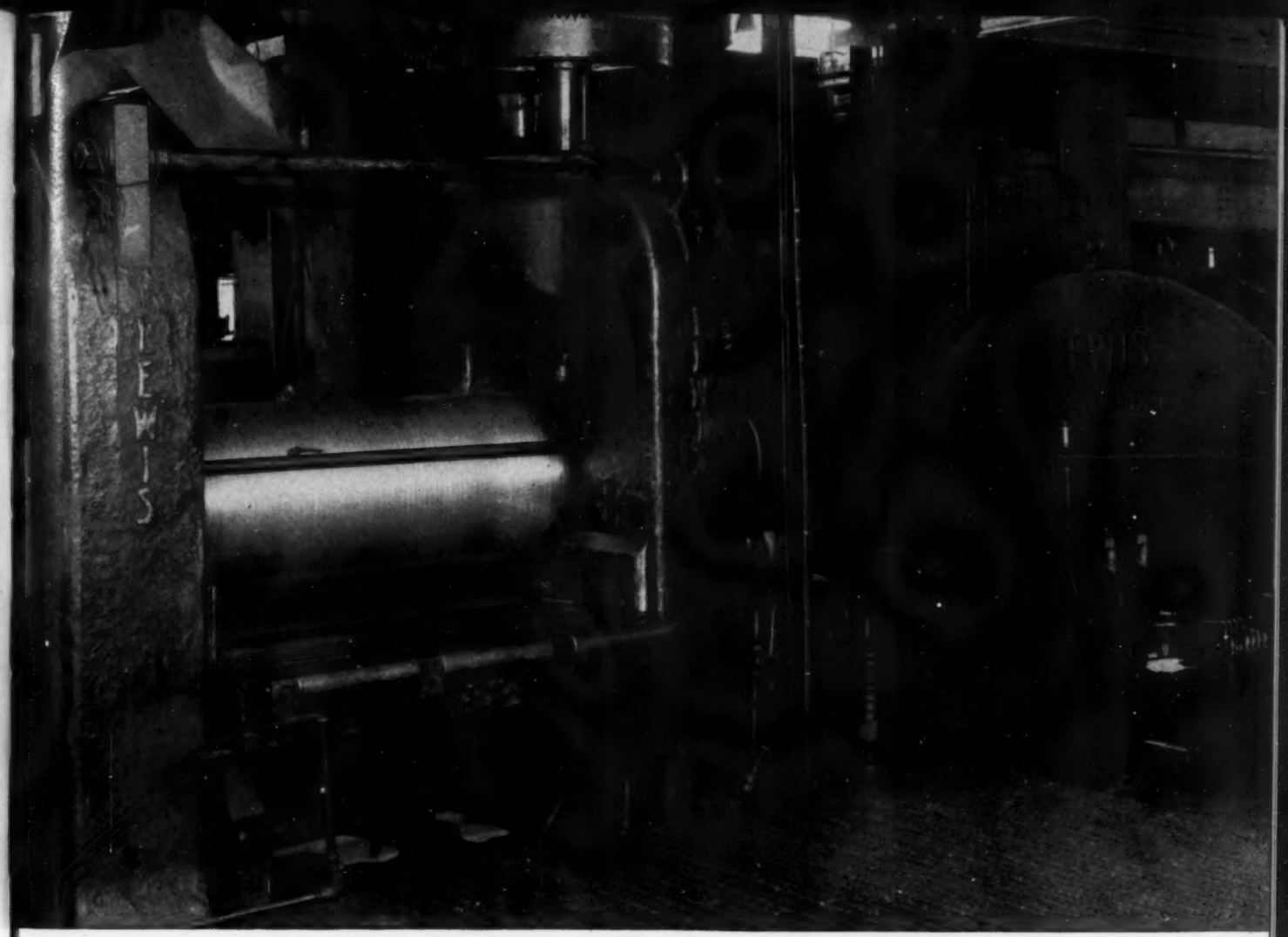

Rolling up a record of longer oil life

No oil deterioration, no bearing failures in four years with . . . . . .

IMPROVED STANOIL

The hot strip rolling mill shown above—located in a midwest metalworking plant—rolls out high-temperature aluminum ingots into thin sheets. On the bearings and drive gears of this hard-working mill, Stanoil is setting a record of lasting, protective lubrication.

More than ten competitive oils had been tried with unsatisfactory results. The job required a stable, heat-resistant oil of viscosity high enough to take heavy loads . . . yet sufficiently fluid to supply adequate lubrication both to bearings and to drive gears. Of the oils tried, only Stanoil qualified.

Now, after four years' service with Stanoil, the plant superintendent reports: No oil deterioration, no bearing failures, reduced oil consumption. Result: An important reduction of plant maintenance costs.

A test of Stanoil in your plant may lead to reduction of oil replacements and to consequent savings. A Standard Oil Lubrication Engineer will be glad to help you. Write Standard Oil Co. (Ind.), 910 S. Michigan Ave., Chicago 80, Ill.

For improved lubrication of . . .

- **Compressors and Ice Machines**
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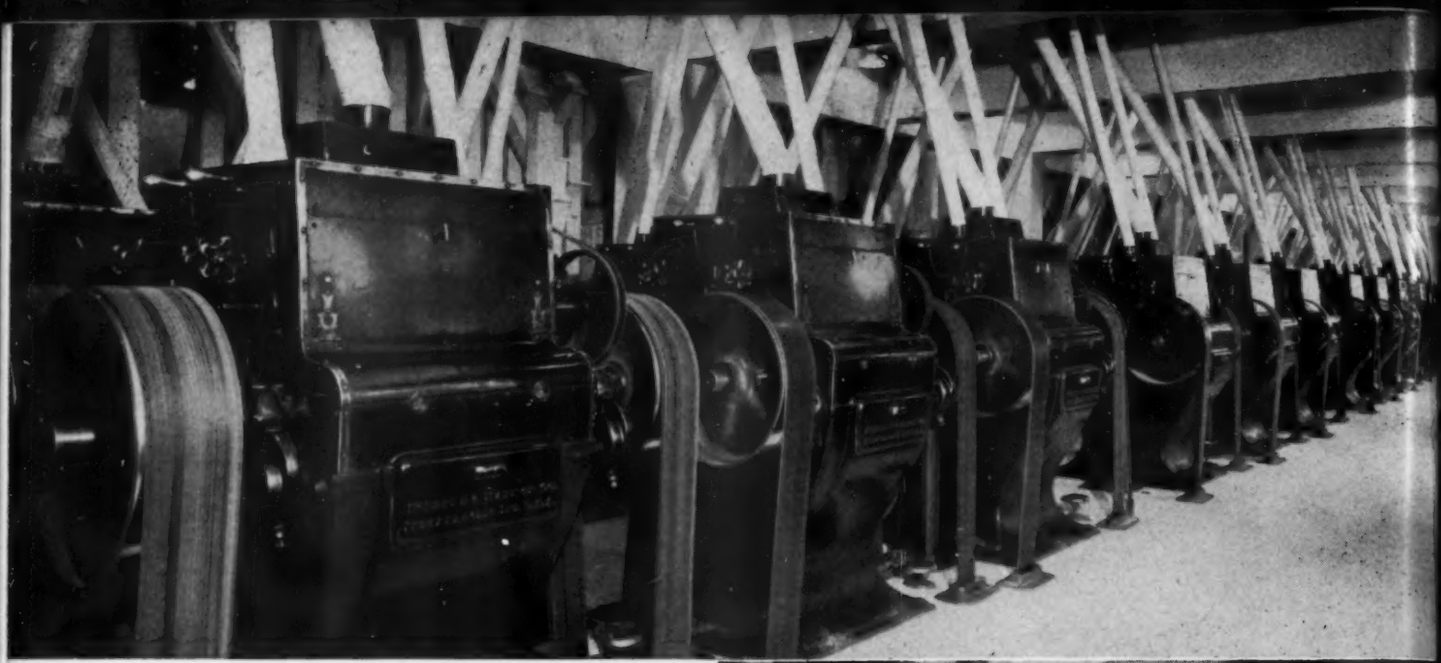
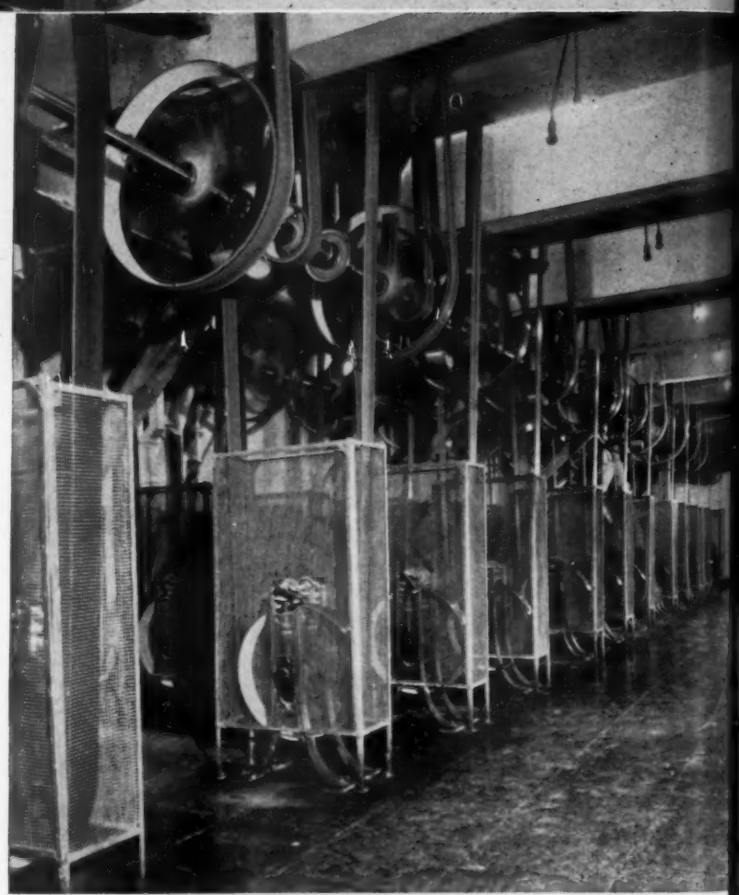


Cleaner operation...

cooler-running bearings...

lower power demand...with

Stanodrip



TESTS in a large midwest flour mill quickly proved the superior lubricating and dripless qualities of Stanodrip.

Oil leakage from ring-oiled bearings on the rolls and the line shafting had jeopardized clean operation. Overheating of roll bearings had lowered operating efficiency.

But Stanodrip stayed in the bearings, provided protective lubrication and reduced power demand for starting the mill.

Unusual stringiness and driplessness give this unique oil an adhesive quality that prevents oil throw-off or leakage. Instead of conventional soap or rubber thickening ingredients, Stanodrip contains a thickening component that resists oxidation and separation.

To test or discuss the possible advantages of Stanodrip in your plant, a Standard Oil Lubrication Engineer will be glad to call on you. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

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NEW! FOOLPROOF!

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TWO-WAY SHUT-OFF COUPLING

● SEALS BOTH ENDS OF LINE— AUTOMATICALLY...INSTANTANEOUSLY ●

The new Hansen two-way shut-off coupling provides for easy—quick—safe connecting and disconnecting of hydraulic and pneumatic lines. This unique "spool type" valve coupling permits the instant sealing of each end of the lines immediately upon disconnection of plug from socket. To connect, you pull back sleeve and merely push plug into socket—coupling is connected and locked—valves in socket and plug are open, automatically permitting oil or gas to flow freely in either direction. To disconnect, push back sleeve — this disconnects coupling. Socket and plug are each positively sealed, automatically preventing loss or spillage of fluid. Check the many advantages in time, labor and cost savings provided in this new Hansen two-way shut-off coupling.

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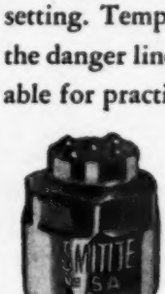
STA-KOOL DIAMOND TOOLS

30 to 50% Longer Tool Life is obtained with the JKS STA-KOOL Tool because of its internal ducts and fins which permit quantities of coolant to circulate in and around the setting. Temperature is thus kept well below the danger line, increasing diamond life. Available for practically all makes of machines.



SMITITE DIAMOND TOOLS

Resetting Costs are Eliminated in straight dressing operations with the use of JKS SMITITE Tools. Carefully selected, small stones are set for life in matrix that slowly wears away with the diamonds. Fresh cutting edges are always obtainable by a simple turn of the tool, until the diamonds are entirely consumed.

For further information on the above tools or the complete JKS line of diamond tools, write

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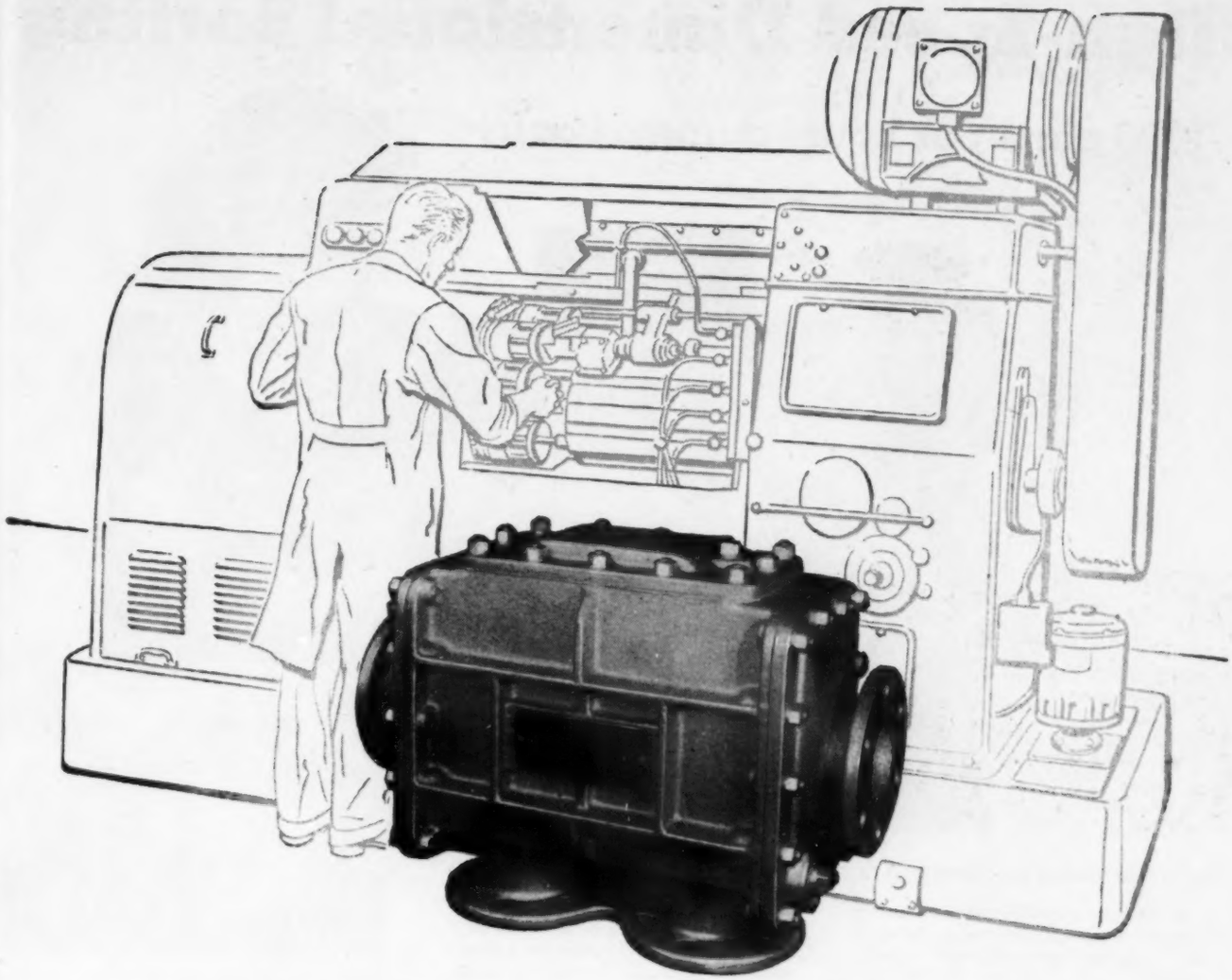

High Production Schedules Call For Harrison Oil Coolers

At no time is proper oil temperature more important than when machines are operating continuously. By keeping oil within the most effective temperature range, Harrison Oil Coolers minimize wear and reduce "down time" required for maintenance.

Harrison Oil Coolers are increasing production efficiency in a wide variety of industrial installations. Compact, sturdy and dependable, they are available in types and sizes to meet practically any requirement.

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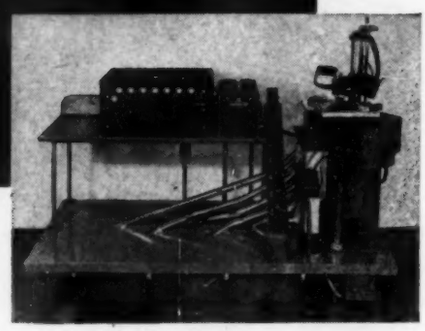
HARRISON RADIATOR DIVISION OF GENERAL MOTORS, LOCKPORT, NEW YORK

High-Speed Dimensional Sorting

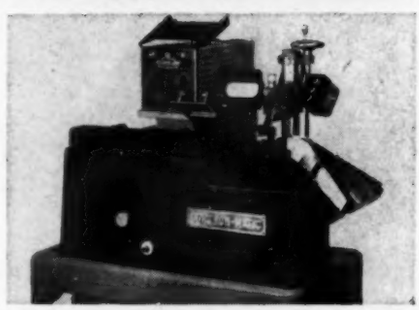
3600 parts per hour – *automatically*



Both diameter and length accurately sorted by *Electronics*

Imagine the economy and efficiency of sorting critical dimensions automatically by these *electronically* operated Gages.

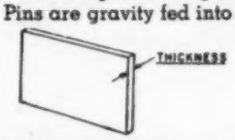
3600 Esterbrook pen barrels are segregated into 8 size categories per hour. *Three times faster* than previous methods. Barrels which are too short and too long are rejected first. Those OK for length are then sorted into 4 acceptable diameters, differing by only .002". All over and under sized diameters are rejected. Barrels delivered into all categories are automatically counted: a tie-in with Quality Control. The economy of this Federal Sortron-Matic Gage has resulted in an order for a second with hopper feed.



Piston pins sorted to .0002" over entire length →

This Sortron-Matic Gage sorts centerless ground piston pin diameters into 3 categories — OK, oversize for refinishing, and rejected undersize. Each pin is gaged for diameter throughout its length, *spirally*. Both the gaging and the sorting are completely automatic. Pins are gravity fed into the Gage.

Thickness of thin sheet stock →



Thin sheet stock is automatically sorted into 10 categories differing by .00025" in thickness; 8 acceptable thicknesses plus over and under required thicknesses. The operator merely places the pieces between contact points. The Gage automatically delivers them to 10 bins according to their thickness. All Sortron-Matics can be arranged to count.

* * *

If you have much 100% inspection or sorting, it will certainly pay you to investigate the possibilities of a Federal Sortron-Matic. Write to Dept. 83 for further data.

FEDERAL

SORTRON-MATIC EQUIPMENT

BY FOOTE PIERSON

MANUFACTURED EXCLUSIVELY FOR

FEDERAL PRODUCTS CORPORATION

1144 EDDY STREET • PROVIDENCE 1, R. I.

● Dimensional Dial Indicators and Indicating Gages — mechanical, electronic, air, multidimensional • Automatic Sorting • Dimensional Machine Control • Combinations of these methods.

Here's how Speed Nuts really cut costs!

ATTACHING CAGE NUTS

ATTACHING SPEED NUTS

COST REPORT

ITEM: Fastening Rear Fenders To Body

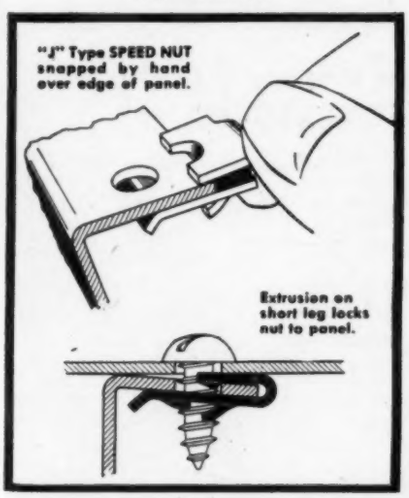
DESCRIPTION	No. per car	Material	Direct Labor	Overhead	Mfg. Cost
Cage Nut (Welding Type)	18	1512			1512
Bolt (5/16 - 18 x 1)	18	.0918			.0918
Lock Washer	18	.0072			.0072
Plain Washer	18	0234			.0234
Spot weld 9 welding nuts to R & L Wheelhouse Panels			2200	3850	.6050
Assemble R & L Fenders to Body			.1800	.3150	.4950
TOTAL for Welding Nut		.2736	4000	.7000	1.3736
Speed Nut ("J" Type)	18	.1116			.1116
Bolt (5/16 - 10 x 5/8)	18	0828			.0828
Plain Washer	18	.0234			.0234
Attach 9 Speed Nuts to R & L Wheelhouse Panels			.1100	.1925	.3025
Assemble R & L Fenders to Body			.1350	.2363	.3713
TOTAL for Speed Nut		.2178	.2450	.4288	.8916
SAVINGS		.0558	.1550	.2712	.4820

Proof...that SPEED NUTS slash overhead and handling costs

- LOCK WASHER ELIMINATED
- SPOT WELDING ELIMINATED
- SPEED NUT COSTS LESS
- BOLT COSTS LESS
- LABOR COST IS LESS
- OVERHEAD IS LESS

Total saving for one operation using only 18 SPEED NUTS

Don't miss the SPEEDNUT Exhibit at Booth No. 210 NATIONAL METAL CONGRESS



On this one simple operation, a prominent automobile manufacturer saved 48c per car by changing over to the SPEED NUT System of Fastening. Simple mathematics point out the phenomenal savings made possible by widespread use of SPEED NUT brand fasteners.

42c of this total was saved by reducing overhead and handling costs. With SPEED NUTS on the assembly line, welding machines were eliminated. Less floor space needed. Less material handling. Easier final assembly—and ⅓ of the men transferred to more productive work.

Look this report over carefully. Compare those direct labor and overhead charges and then drop us a line and find out for yourself what the SPEED NUT savings factor can do for you.

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Speed Nuts*

MORE THAN 4000 SHAPES AND SIZES

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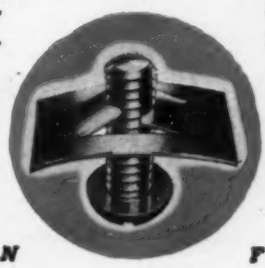


FASTEST THING IN FASTENINGS

SMALL... extra payload SIZE

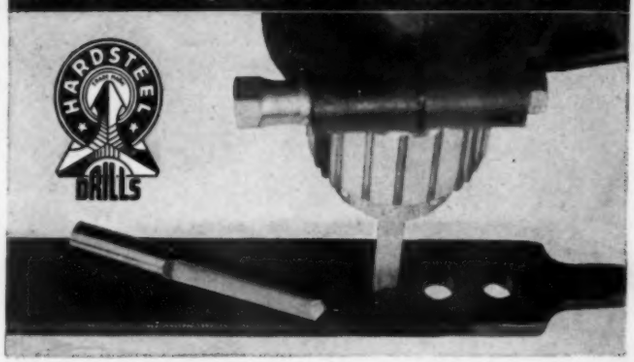
THAT'S an exact description of these BCA ball bearings. BCA designed them specifically for the transmission of the Bell Helicopter. They are assembled in matched pairs on the shafts of the first and second planetary gears to take radial and thrust loads in either direction. Each of these BCA ball bearings is smaller than a silver dollar, yet they withstand service conditions that normally call for considerably larger bearings. Inner and outer races are matched to 1/10,000 of an inch.

Whether your applications call for custom built or standard ball bearings, get in touch with BCA—industry's headquarters for soundly engineered ball bearings since 1897.

BCA BEARINGS COMPANY OF AMERICA
LANCASTER, PA.

BCA RADIAL · ANGULAR CONTACT · THRUST BALL BEARINGS

Drill Hardened Steels *without Annealing* with "HARDSTEEL"



Don't let anyone tell you that hardened steels must be annealed before drilling, countersinking, counterboring or reaming.

With "HARDSTEEL" drills you can produce accurate, smooth holes in steels hardened by any process — oil-hardened, water hardened, cyanided, nitrided, and they work equally well on work-hardening steels, and high carbon-high chrome steels of any degree of hardness.

"HARDSTEEL" drills used with standard drill presses cut costs in production shops because parts drilled after hardening always match at assembly. In service shops they save time and material and permit engineering changes calling for additional drilling to be made after parts are full hardened.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are now functioning in thousands of plants in parts recovery operations.

You Harden It — We'll Drill It — with "HARDSTEEL"

"HARDSTEEL" Tool bits make faster, deeper cuts on steels and non-ferrous alloys.

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"HARDSTEEL"
DRILLS · TOOL BITS · SPECIALS

TEETH are TOUGH BACKS are STRONG

When your Hack Saw Blades are made of these Ingersoll Hack Saw Steels

ENGINEERING B-W PRODUCTION

Whenever you order hack saw blades from your regular hack saw blade maker, be sure to get blades with tough teeth and strong backs. Whichever type you prefer, you'll find that INGERSOLL "18-4-1" and INGERSOLL D-B-L Steels give you blades with tougher cutting edges, higher impact resistance and relative freedom from decarburization.

So for tough blades that give a smooth, easy cut, take advantage of Ingersoll's lifelong research in special steels! Specify hack saw blades made of INGERSOLL "18-4-1" or INGERSOLL D-B-L Hack Saw Steel.

*Furnished in INGERSOLL D-B-L "5-4" and INGERSOLL D-B-L 2, "6-5".

INGERSOLL *Steel Division*

BORG-WARNER CORPORATION • NEW CASTLE, INDIANA

Plants: New Castle, Indiana • Chicago, Illinois • Kalamazoo, Michigan

INGERSOLL "18-4-1" INGERSOLL D-B-L* Hack Saw Steels

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Soft Center Steels
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Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

For Accurate Finishing of
SPHERICAL · CONICAL · ANNULAR
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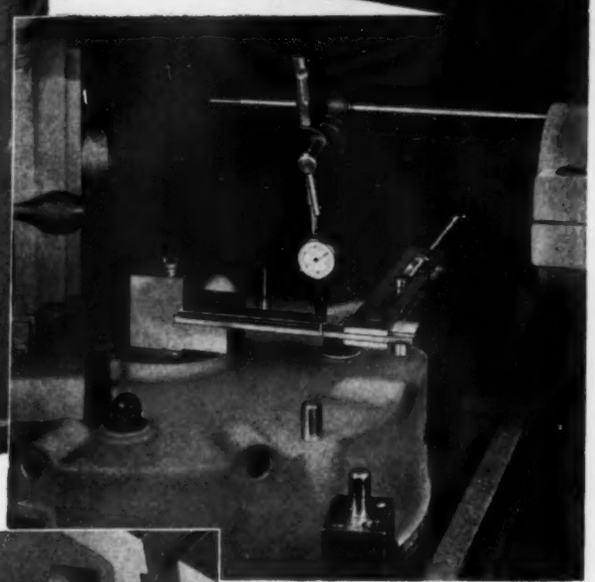
Investigate the New
GEARGRIND *Universal Oscillating* PRECISION GRINDER



This versatile machine, displayed for the first time at the Machine Tool Show, grinds external and internal cylindrical surfaces, generated or formed spherical external and internal surfaces, external conical surfaces, internal tapers, ball bearing races and fillets.

With a single set-up combinations of the above may also be ground, securing perfect blending of straight and curved surfaces and extreme accuracy.

Sine bar arrangement in place, showing method of setting work-head at any predetermined angle.

Worktable clamping device, with micrometer adjustment.

The GEAR GRINDING MACHINE COMPANY
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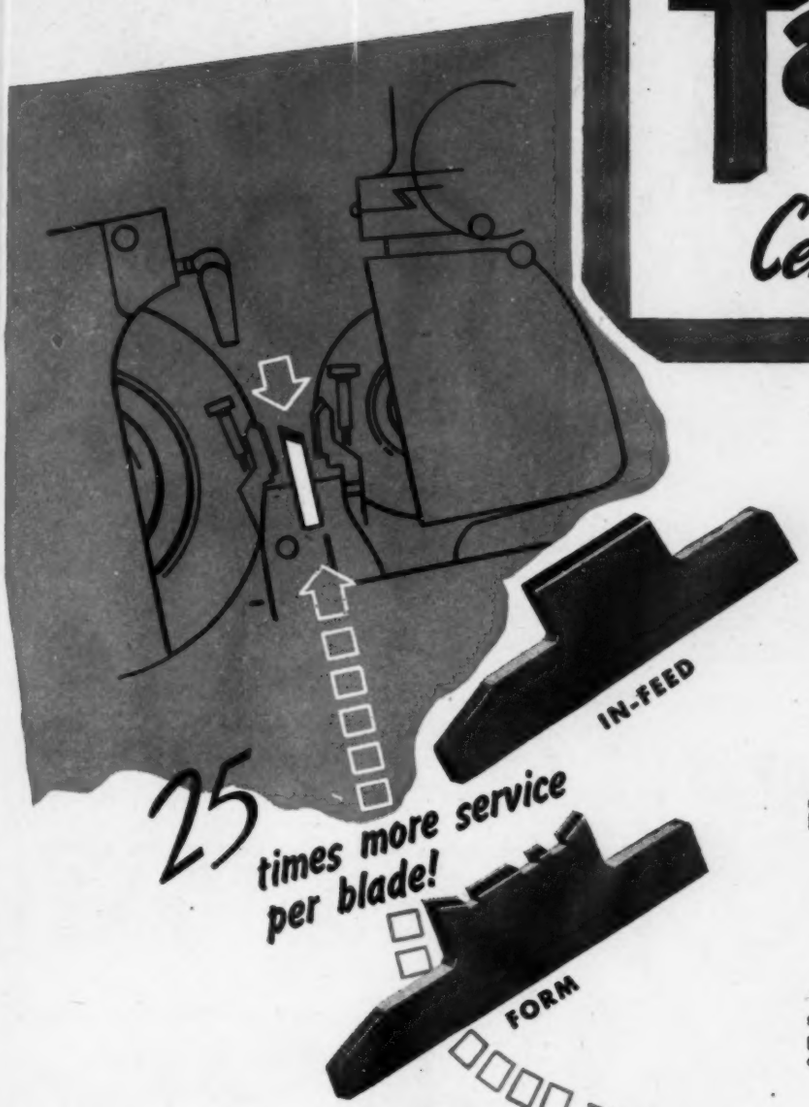
Write for Literature
Illustrates many set-ups and gives full information and specifications.

Talide
(TUNGSTEN CARBIDE)

Centerless Blades



ADVANTAGES

- Service life at least 25 times longer.
- One solid strip — no sections, lines, or seams to mark or score the work. (Only Metal Carbides makes Tungsten Carbide wear strips in one solid piece of any length.)
- Continuous operation reduces cost, scrap and down time.
- Blades available from stock.

STANDARD TALIDE BLADES SHIPPED FROM STOCK

We carry Talide centerless grinder blades and other standard Talide products at the following warehouses:

Newark, N. J., 166 Bloomfield Ave.

Youngstown, Ohio, 107 East Indianola Ave.

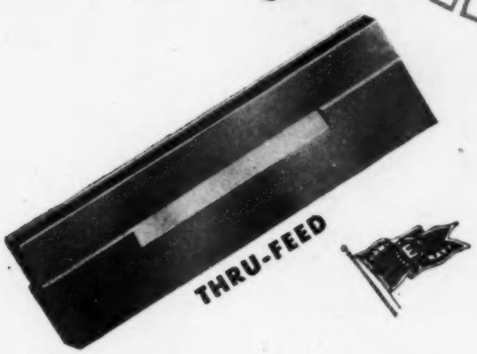
Chicago, Ill., 601 W. Milwaukee Ave.

(Sales engineers in Newark, Pittsburgh, Detroit, Indianapolis and Chicago.)

In addition to standard blades, we design and manufacture form or step blades for use in grinding parts with multiple diameters, steps, tapers, contours or other special shapes.

Forward part or drawing for estimate.

TALIDE METAL MEETS EVERY REQUIREMENT



A service life of 25 to 1 for Talide Blades over others is conservative. On most applications, these blades outwear cast iron, tool steel or hard-faced blades as much as 50 to 75 times.

Finished ground by diamond wheels, Talide work supports (made from hardest metal known) have exceptional surface quality and finish. To preserve this quality, we protect the Talide strip with a special plastic coating and pack each blade in an individual carton.

For the full production story, send for Talide Blade catalog 46-WP, complete with prices, sizes and specifications.

SINTERED CARBIDES — METAL CARBIDES CORPORATION — TALIDE — YOUNGSTOWN, OHIO — HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

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Maximum precision in the making...

Photo Courtesy of Hallicrafters Co.

with...

KESTER CORED SOLDERS

- When soldering operations call for precision, permanence and dependability, Kester Cored Solders fill the bill.
- Kester Cored Solders carry positive acting fluxes right in their cores. They're applied in one, mistake-proof operation. The Kester way of applying flux and solder simultaneously saves you time and reduces the work of soldering to an absolute minimum.
- Kester Acid-Core solder, for general use, forms a connection that remains tight and clean under all operating conditions. Its core will not leak, nor will its flux gather moisture.
- Kester Rosin-Core Solder is manufactured to fill the requirements of any electrical circuit. Its patented plastic rosin flux will not cause corrosion nor injure insulation.
- Kester experience is at your service to determine the best solder formula and practice for your operation. Write fully and be assured of Kester engineering cooperation without obligation.

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Cored Solders
STANDARD FOR INDUSTRY

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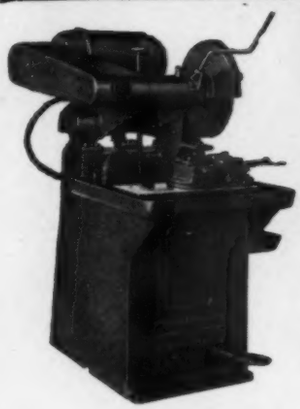

WET ABRASIVE CUT-OFF MACHINE

. . . for straight or angle cutting of practically any material used in general manufacturing . . . including such metals as brass, copper, aluminum, as well as fibrous and plastic materials in various sizes, angles and shapes.

Suitable for making straight or angle cuts in solids up to 2¼" or tubing up to 3½" diameter. Same vise is suitable for various cuts. Maximum capacity is 2¼" in cutting angles up to 45°. Graduations on table make angle-cutting fast and accurate.

Alternating or direct current.
Write for complete details.

TRADE *The Cincinnati* MARK
THE CINCINNATI ELECTRICAL TOOL CO.
Division of THE R. K. LeBLOND MACHINE TOOL CO.

Almond Drill Chuck

The Original Manufacturers of Drill Chucks

. . . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

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PRODUCE WHERE PRESSURES ARE TERRIFIC!

Bars and tubes give under the terrific pressure, but there's no interruption in the dependable performance of Reliance Heavy Duty D-c. Motors which power straighteners.

Where pressures are severest in processing iron and steel, Reliance Heavy Duty D-c. Motors are right in their element! Designed and built, electrically and mechanically, to stand up longer in the toughest going, these rugged motors offer the maximum in dependability and economy. There is a type to satisfy the power requirements of every job where operating conditions demand a heavy duty motor. Call your nearest Reliance Sales Representative!

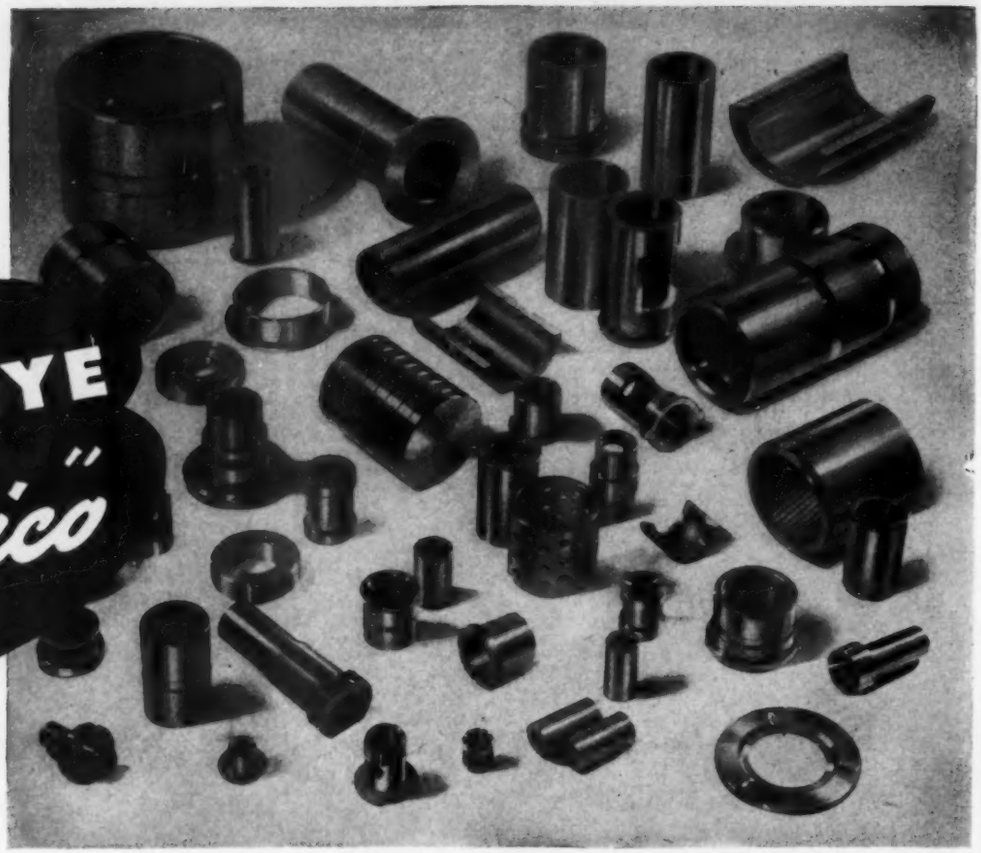
Reliance Heavy Duty Type T Motor

RELIANCE ELECTRIC & ENGINEERING CO.

1075 Ivanhoe Road **Cleveland 10, Ohio**

Appleton, Wis. • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Dallas • Denver • Detroit • Gary Grand Rapids • Greenville, S. C. • Houston • Kansas City • Knoxville • Los Angeles • Milwaukee • Minneapolis New Orleans • New York • Philadelphia • Pittsburgh • Portland, Ore. • Roanoke, Va. • Rockford St. Louis • San Francisco • Seattle • Syracuse • Tampa • Tulsa • Washington, D. C. • Sao Paulo, Brazil

RELIANCE A-C D-C MOTORS



BUCKEYE "Lubrico"

Exceptional Quality HIGH LEAD BEARINGS

THAT COST LITTLE MORE THAN BEARINGS OF STANDARD ANALYSIS

FOR PRECISION airplane parts, pumps, seal rings, important high speed shafts, and in other places where bearing failure would involve critical delays, use Buckeye Lubrico Bearings. They combine a reduced coefficient of friction, excellent conformity to overcome slight shaft misalignment, qualities of self lubrication, good resistance against pounding, and the ability to withstand heavy shock without cracking.

Manufactured from selected metals under Buckeye's exacting laboratory and metallurgical control, these bearings have uniform dispersement of lead throughout. They are free from porosity, and accurately dimensioned assuring speedy, easy assembly. Furnished in any of our 1088 stock sizes, or to customers ID, OD and length; slotted, drilled, flanged or threaded exactly to blue-print. Furnished in three different metal analyses, for light, general, and extremely heavy duty services. Let us quote on your requirements.

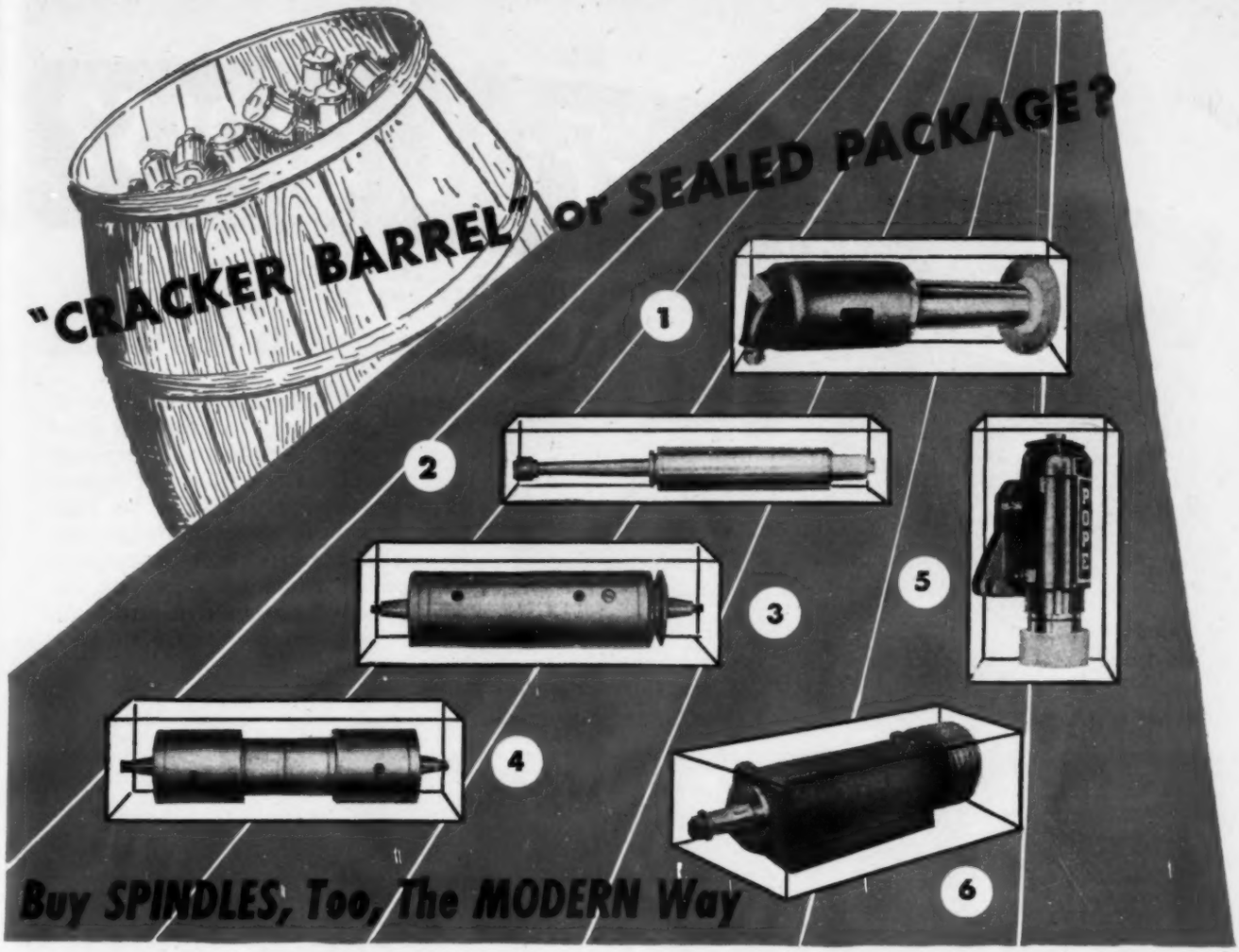
Buckeye

BRASS AND MANUFACTURING COMPANY

BRONZESMITHS SINCE 1900

6412 HAWTHORNE AVE. CLEVELAND 3, OHIO

BRONZE SLEEVE BEARINGS · STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT
IN ANY RECOGNIZED BEARING METAL ANALYSIS



All These POPE PRECISION GRINDING SPINDLES

Are *Sealed Lubrication, Sealed Package* Spindles

No. 1 is a POPE 6" x 18" Surface Grinder Spindle with *sealed-in* 1 HP motor and SKF double row, roller bearings. It produces superfine surface finishes and has the rugged ability to rough off surplus metal fast. Ask for Data Sheet No. 12.

No. 2 is an Internal Grinding Spindle — one of a wide range of sizes and speeds up to 35000 RPM. It produces accurate sized, better finished holes. Ask for Catalog No. 56.

No. 3 is a Tool and Cutter Grinder Spindle for Vee belt drive up to 6000 RPM. It fits standard grinders. Name your cutter and tool grinder and we'll send you an outline drawing.

No. 4 is a Double-Ended Tool and Cutter Grinder Spindle, belt driven with twin pulleys for two speeds from step pulley on motor. Speeds up to 6000 RPM. Fits standard grinders. Name your cutter and tool grinder and we'll send you an outline drawing.

No. 5 is a Surface Grinder and Boring Mill Spindle. It comes with 3, 5 or 10 HP motor running at 1200, 1800 or 3600 RPM. Ask for Data Sheet Nos. 16, 17, 18, 19.

No. 6 is a Wheel Head for special grinding, boring and other operations requiring from ¼ to 50 HP and speeds to suit your needs. Tell us your requirements.

POPE designs and builds special motorized Spindles in sizes from ¼ HP to 50 HP, with standard or high cycles, for speeds up to 54,000 RPM.

These Modern, Sealed Package Spindles Are Now Available For Quick Delivery

No. 46

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

201 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

A lamination die made with punch holes in pie sections.

Need — SPECIAL TOOLS?

CRT offers you expert engineering service and a complete modern plant

● Let CRT engineers work with you for the right solution to your special tool problems. Cleveland Republic Tool is a contract manufacturer, expertly staffed to produce complete special machines, component parts, sub assemblies and special tools of a precise nature. A wholly owned foundry division complements the CRT plant.

Write, wire or phone Diamond 7300 for prompt engineering service.

Cleveland Republic Tool
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9615 Meech Avenue • • • • • • Cleveland 5, Ohio

CRT

NATIONAL KEYSEATING MILLER

the tool that converts drilling machines into key-seaters and saves time and money

● With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

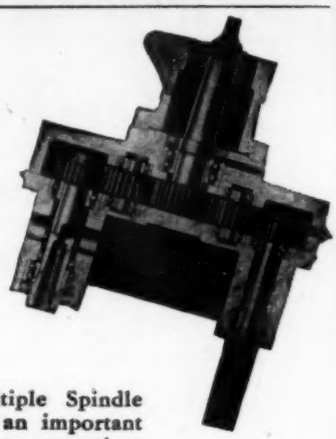
The National Keyseating Miller mills, keyseats in one cut. It can be used on offset holes and blind holes. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-seven different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

COURTING FAST COMPANY?



THRIFTMASTER Multiple Spindle Drillheads can play an important part in speeding up your operation. They are individually designed to meet the requirements of each specific job and to operate at *full capacity of the tools* for maximum production.

The heavy duty gear assembly is fully enclosed in an oil and dust sealed housing and is lubricated by immersion. All rotating parts are ball bearing mounted. Maximum spacing is provided between spindle ball bearings to secure rigidity.

For recommendations and descriptive catalog of both fixed and adjustable type heads, write:

Engineering Department
THRIFTMASTER PRODUCTS CORPORATION
1048 N. Plum Street • Lancaster, Pa.

THRIFTMASTER
Multiple Spindle Drillheads

TURN OUT HIGH QUALITY BIG CASTINGS FASTER, EASIER

...WITH WICKES NO. 4 DIE CASTING MACHINE

WICKES.. manufacturers of heavy duty engine lathes and other specialized machinery for 97 years—now brings you the *fastest-producing, easiest-operating* die casting machine of its size. It's the new Wickes No. 4 Die Casting Machine for lead, tin, and zinc alloys. It's fast!—dies open and close at the rate of 750" per minute, with a momentary slowdown just before closing. Up to 600 shots per hour —up to 25 lbs. zinc each—are injected at pressures of 1,500 to 6,000 P.S.I. A lightning-fast accumulator injects the molten metal into the die cavity, eliminating auxiliary air compressors and nitrogen flasks. The Wickes No. 4 Die Casting Machine *reduces set-up time to a minimum,* because the distance between bolster plate and platen is easily adjusted from 9 to 23 inches with just one lever. Now dies can be installed in record time—*no time-wasting adjustment of tie bars.* Dual metal pots, alloy steel tie bars, shockless die clamping pressure applied through toggle mechanism.

Our engineers will be glad to show you how the Wickes No. 4 Die Casting Machine will increase your profits by enabling you to produce a wide variety of high quality castings at high speed and lower cost in your plant. *Write today for complete particulars.*

WICKES BROTHERS

Established 1854

SAGINAW, MICHIGAN

To Men Who Know Motors

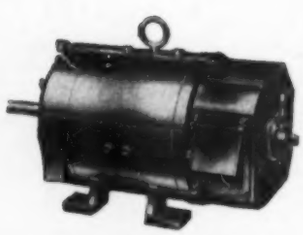
... we could end our message here!

To men who know motors, a picture like this is worth the proverbial ten thousand words. It speaks with convincing eloquence of craftsmanship to which any motor builder could point with pride.

If you visit Star's modern plant, you'll see scores of examples of the same painstaking craftsmanship that pays off in outstanding performance for Star customers.

Star not only builds motors well, but also takes leadership in design. Star led in welded steel construction ... pioneered ball bearing motors ... developed the famed Star Built-in Magnetic Disc Brake for motors ... pioneered in the field of gear-motors.

Whether you need special or standard motors, ½ to 200 H.P., it will pay to learn why so many critical buyers specify "Star". Star Electric Motor Co., 200 Bloomfield Avenue, Bloomfield, N. J.



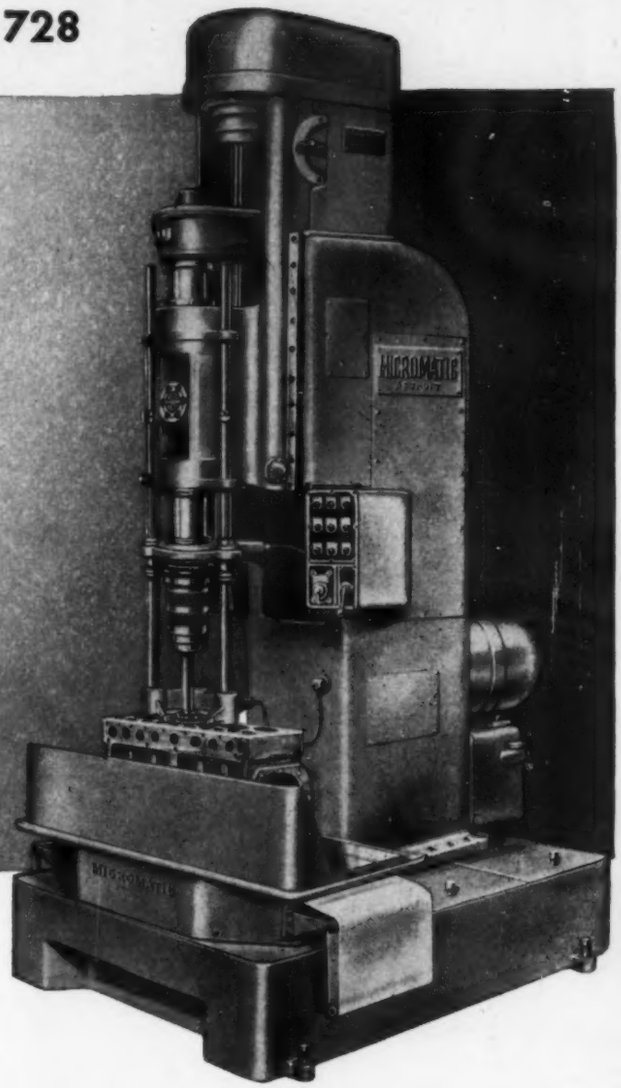
Integral HP Motor for Direct Current

STAR MOTORS

POWER PACKAGED AS YOU NEED IT

New MICROMATIC QUILL-TYPE HIGH PRODUCTION HYDROHONERS

MODELS 723, 724 and 728



THESE new spindle-in-quill, unit constructed, hydraulically actuated, heavy duty Hydrohoner machines are designed for Microhoning bores from ¼ in. to 4 in. in diameter, in lengths from ½ in. to 9 in. in high production. When equipped with the latest electronic MICROSIZE control, uniform size is automatically and dependably generated within 0.0001 in. to 0.0003 in.

Important advantages are gained by the spindle being in the quill: torque and thrust are taken about the centerline of the spindle—guide bars are unnecessary—alignment is assured—the weight of machine parts reciprocated in stroking is substantially reduced—reciprocating speeds may be increased without added power input.

By combining spindle rotation speed control, stroke control, hydraulic control panel, and MICRODIAL mechanisms in the head unit, all mechanical linkages, hydraulic pipe and fittings, usually required are eliminated.

All electrical equipment is located for most convenient service and maintenance.

Specifications

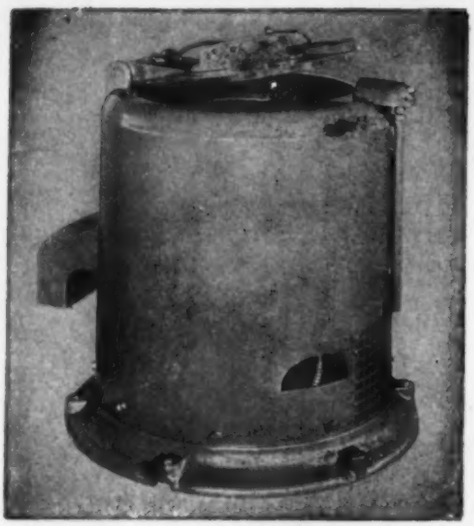
Model	723	724	728
Work capacity, dia.	¼—1"	¾—2"	1½—4"
length	¼—6"	¼—8"	¼—9"
Overall height x width x length	110x44½x60½"	127x44½x60½"	127x44½x60½"
Base at floor, width x length	44½x60½"	44½x60½"	44½x60½"
Spindle reciprocation stroke	0—7⅛"	0—⅞"	
Quill stroke	10	12	12
Clearance—spindle to column	10	10	10
Spindle nose to pads, max.	46	48	48
Hydraulic oil capacity	25	25	25
Coolant tank capacity	60	60	60

MICRO MATIC TRADE MARK REGISTERED

MICROMATIC HONE CORPORATION • DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, Cal. • 194 Dalhousie St., Brantford, Ont., Can. • 616 Empire Bldg., 206 S. Main St., Rockford, Ill. 927 A—M & M Bldg., P. O. Box 981, Houston 2, Texas • Post Road, Guilford, Conn.

DRY SMALL PARTS QUICKLY and ECONOMICALLY with BARRETT CYCLONE CENTRIFUGAL DRYERS



The Barrett Centrifugal Dryer — efficient, self-contained, and compact is built in several sizes.

• The Barrett Parts Drying Process centers around a method of creating a guarded cyclone.

In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

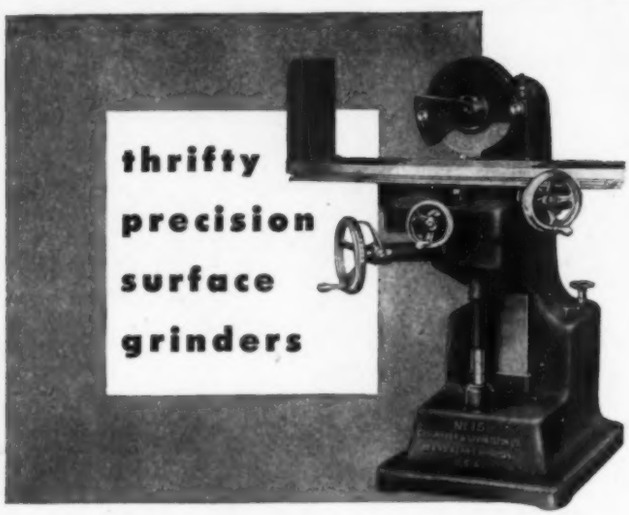
Direction of basket rotation can be quickly reversed which will change position of the load and accelerate drying. Baskets are available in shapes which experience has shown to be most effective for handling various classes of work.

It will pay to investigate the advantages offered by Barrett Centrifugal Dryers on your work.

Full Details of the Barrett Cyclone Dryer Sent Promptly on Request.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery



This Grand Rapids No. 15 Motor Driven Hand Feed Surface Grinder can, in many instances, be used more profitably than the more costly Hydraulic Feed Surface Grinders . . . and we make both types.

Write for descriptive bulletin

GALLMEYER & LIVINGSTON COMPANY

Manufacturers of Grand Rapids Grinders

330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

A PERFECT HOLE IS A LOVELY THING!

Especially to the precision manufacturer whose spoilage is excessive.

But clock, watch and instrument makers have learned that a perfect hole is routine when Hamilton Super Sensitive Drilling Machines are used. For these small-hole drills (.004" to 5/16" in all drillable materials) are, themselves, precision instruments. What's more, they maintain their accuracy under tough production loads.

Among the precision industries, 80% of our present installations are repeat orders. Proof of user satisfaction.

Investigate! Take a minute now to clip this ad and send it in. We will mail you full particulars.

THE *Hamilton* TOOL COMPANY

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COMING TO THE MACHINE TOOL SHOW? You are cordially invited to visit Scully-Jones plant. Call LAWndale 8770 for easy directions to the factory.

PRICES REDUCED!

ON THESE
SCULLY-JONES CENTERS

SOLID HIGH-SPEED STEEL CENTERS *REDUCED 48%*

CARBON STEEL CENTERS *REDUCED 32%*

Now you can buy the famous Scully-Jones precision-built, true-running, long-life centers for about One-Half to Two-Thirds of the former prices!

All Scully-Jones Centers, from the smallest to the largest, are ground to a concentricity of .0002". Furnished in Morse, Brown & Sharpe, and Jarno Tapers.

Scully-Jones Solid High-Speed Steel Centers are made from Tungsten H. S. Steel, (18-4-1 analysis) heat-treated to 63-64 Rockwell "C". Now priced comparable to centers that have only high-speed steel points with tool-steel shanks.

Equip your Lathes, Grinders or Special Machinery with these centers at Reduced Prices.

OTHER SCULLY-JONES CENTERS—(1) Solid High-Speed Steel Half Centers. (2) Stellite-Tipped Centers. (3) Tungsten Carbide-Tipped Centers. (4) Special Centers made to your requirements.

For complete information refer to pages 302-307 of Scully-Jones Engineering Manual 500, or write for a list of tapers at these reduced prices.

ARE YOU PLANNING SPECIAL TOOLING?

Send us your drawings and specifications. We will quote promptly and can meet early delivery dates, thus preventing delays in your production schedule.

FREE Valuable Chart, showing Safe Work Load for Centers. Write today for your FREE copy; no obligation.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

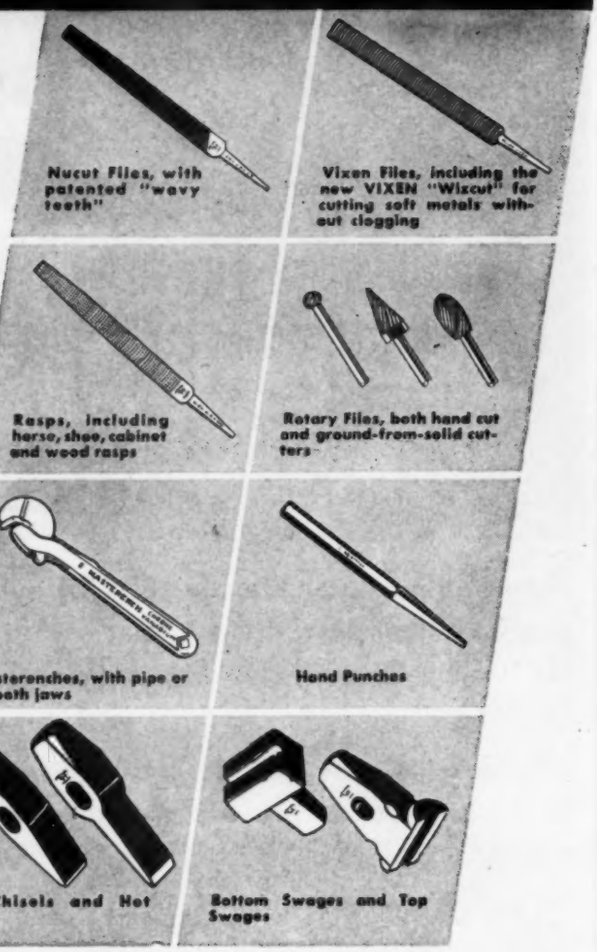
IMMEDIATE DELIVERY!
ON ALL POPULAR SIZES

Scully-Jones AND COMPANY

1902 SOUTH ROCKWELL ST., CHICAGO 8, U.S.A.

NUCUT WAVY TOOTH FILES

GET MORE SERVICE PER DOLLAR with Heller Tools

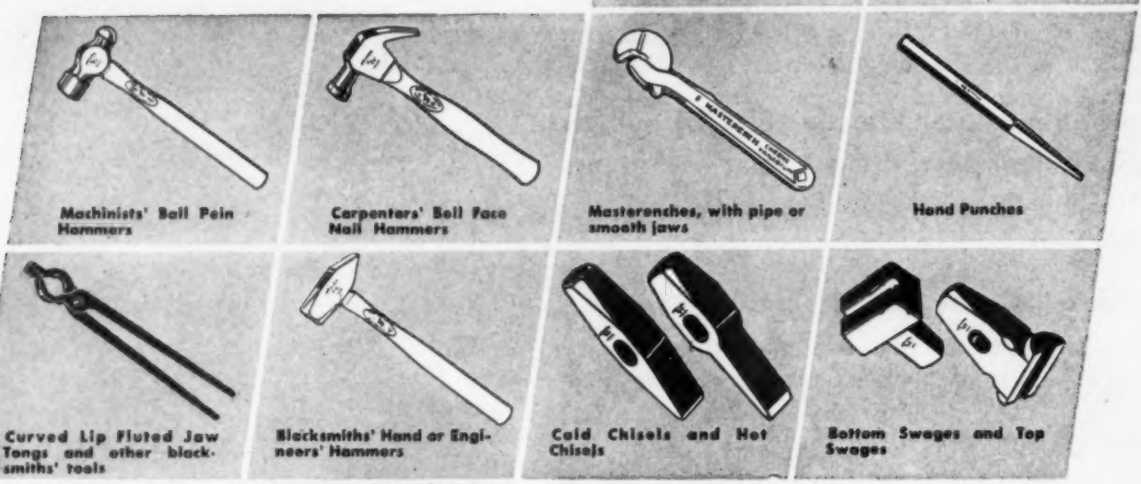


Nucut Files, with patented "wavy teeth"

Vixen Files, including the new VIXEN "Wixcut" for cutting soft metals without clogging

Rasps, including horse, shoe, cabinet and wood rasps

Rotary Files, both hand cut and ground-from-solid cutters



Machinists' Ball Pein Hammers

Carpenters' Bell Face Nail Hammers

Masterenches, with pipe or smooth jaws

Hand Punches

Curved Lip Fluted Jaw Tongs and other blacksmiths' tools

Blacksmiths' Hand or Engineers' Hammers

Cold Chisels and Hot Chisels

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Mill and Saw Files

Special Purpose Files, for aluminum and other metals and alloys

Swiss Pattern Files, for die, tool and other intricate work

File Handles and File Cards

When tools fit the job, handle easily, balance perfectly, work fast, the results you get meet the most exacting requirements. With Heller tools, you can take such advantages for granted. They measure up—by *any* standard!

But experienced craftsmen also prefer them for long service life...downright economy! NUCUT files or Masterenches, hammers or chisels, punches or swages —all Heller tools keep delivering year in, year out. Giving *more* service for your money...stretching *your* tool dollars!

Discover for yourself the advantages of *every* tool in the *complete* Heller Tool Line. See your distributor.

HELLER BROTHERS COMPANY

Newark, N. J. Newcomerstown, Ohio

Good Tools Since 1836

Steel-Weld FABRICATION

Shown Here is a Large Base for a Progressive Automatic Machine, and a Slide for a Mechanical Power Press.

Your welded steel requirements may be something entirely different from the Machine Bases illustrated here . . . but, regardless of design, shape, size, or weight, the Mahon organization stands ready to handle your particular requirements promptly and efficiently. Complete and modern facilities for Cutting, Forming, Welding, Normalizing, Stress Analysis, Sandblasting, Machining and Painting make for economy in production, and a staff of thoroughly competent design engineers and highly skilled workmen are your assurance of every advantage of Steel-Weld Fabrication.

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THE R. C. MAHON COMPANY

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Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

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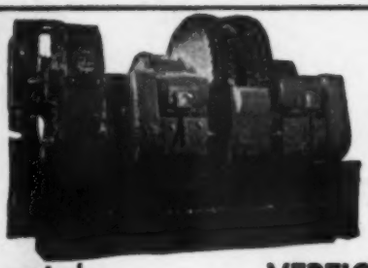
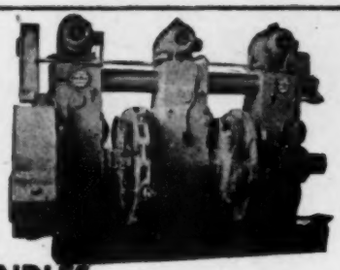
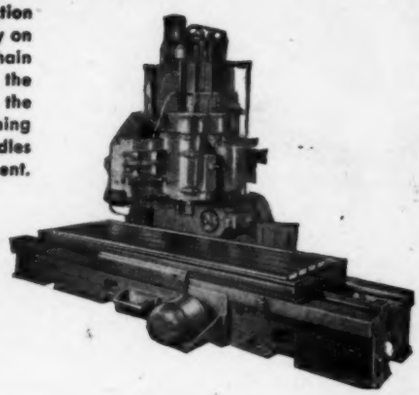


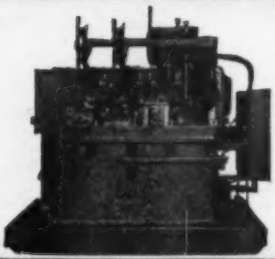
Roto-Matic MILLERS

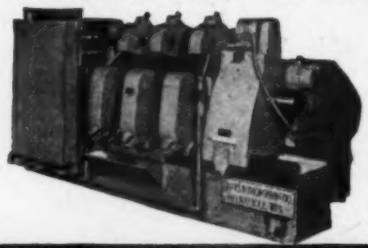


ROTARY DRUM TYPES •
VERTICALS • SINGLE AND MULTIPLE SPINDLES
PLANERS • RISE AND FALL • VERTICAL INDEXING

The ROTO-MATIC principle of continuous production insures the maximum of production and accuracy on any job to which a Miller has been adapted. Chain clamping mechanisms, where adapted, leave the operator free to load and unload parts. On the larger type Rotary Drum Type Millers finishing spindles are adjustable for toe cut. All spindles have provisions for micrometric endwise adjustment.







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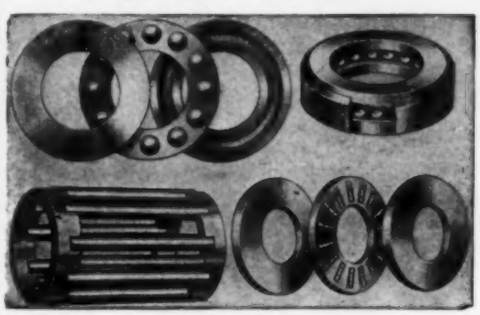
DAVIS & THOMPSON COMPANY
MANUFACTURERS MACHINE TOOLS, MICROMETERS AND GAGES
MILWAUKEE WISCONSIN

If you want
MORE PARTS *per hour*
LOWER COST *per part*

the BARKER WRENCHLESS CHUCK can do it faster, better and stand up to it longer. Where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine, these Chucks will increase production and pay for themselves in 60 to 90 days while doing it. See how a Barker Wrenchless Two-Jaw or Three-Jaw Chuck can speed up production in YOUR plant.

Chuck Division
THOMAS HOIST CO.
22 S. HOYNE CHICAGO 12



PRECISION
B&RB
BEARINGS

Place your order for B & R B Precision Bearings. Deliveries and Service Dependable.

THE BALL & ROLLER BEARING CO., Danbury, Conn.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

No. 1G	INTERNAL GRINDER	No. 34	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	No. 3B	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
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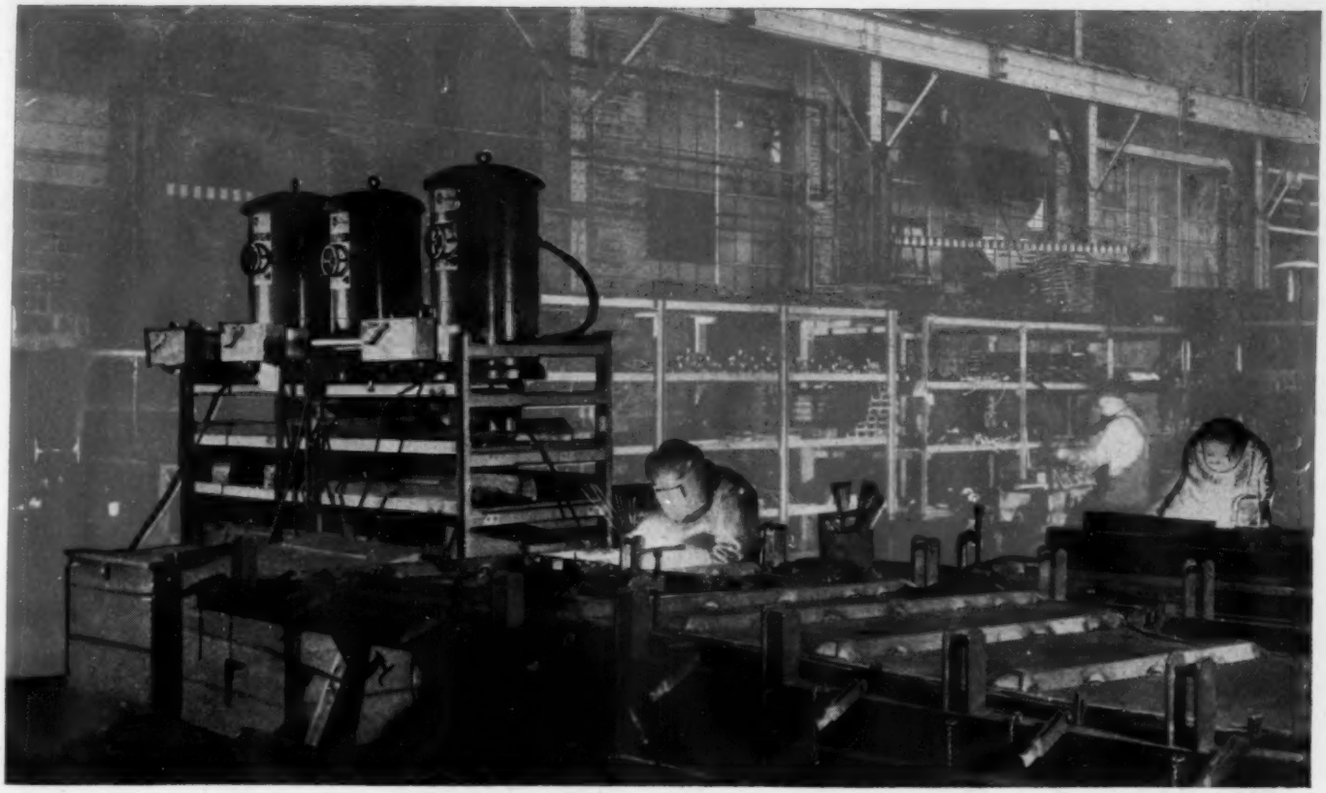

Courtesy The Heil Company

SMITHway A. C. WELDERS cover every welding range

The complete line of SMITHway A. C. Welders includes general-purpose models rated at 150, 200, and 250 amperes and heavy-duty models rated at 300, 400, and 500 amperes.

A single convenient hand wheel controls welding current continuously over a wide range, makes desired selection simple, quick, accurate. Sturdy, welded frames assure long, trouble-free service. Heavy-duty coils maintain safe operating temperatures. Insulation is fireproof Fiberglas.

SMITHway Welders eliminate "arc blow." They permit the use of higher currents and larger electrodes. Difficult welds are made faster, easier, and better. Power costs are cut to a minimum. Practically no maintenance is required.

Weatherproof cases of SMITHway Heavy-Duty Welders assure dependable outdoor service in all kinds of weather. Write for complete specifications and prices on SMITHway A. C. Welders, Welding Monitors, and SMITHway *Certified* Welding Electrodes.

SMITHway *Certified* ELECTRODES

Proved in production, they give you better welds at lower welding costs. For all kinds of jobs in all kinds of shops. SMITHway Electrodes are

Made by Welders . . . for Welders

SMITHway Farm Welder

On-the-spot maintenance and repair — anywhere 230-volt A. C. power is available. Range: 25 to 180 amperes. Weighs only 240 lbs. Rugged, simple to use, safe.

A.O. SMITH Corporation

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CHICAGO 4 • TULSA 3 • MIDLAND 5 • DALLAS 1 • HOUSTON 2 • NEW ORLEANS 18
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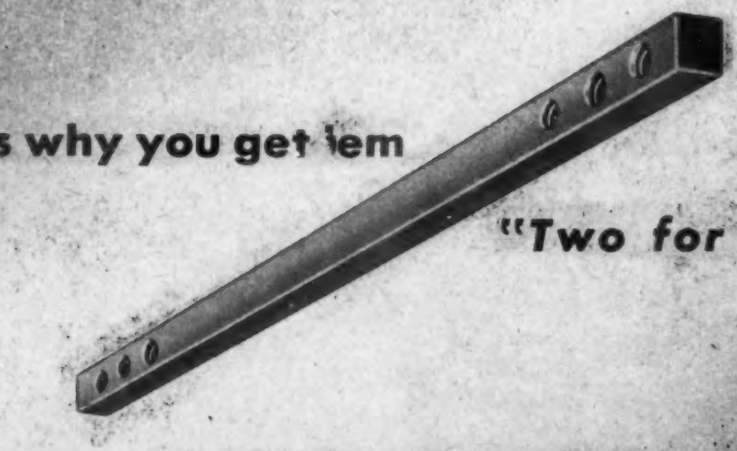
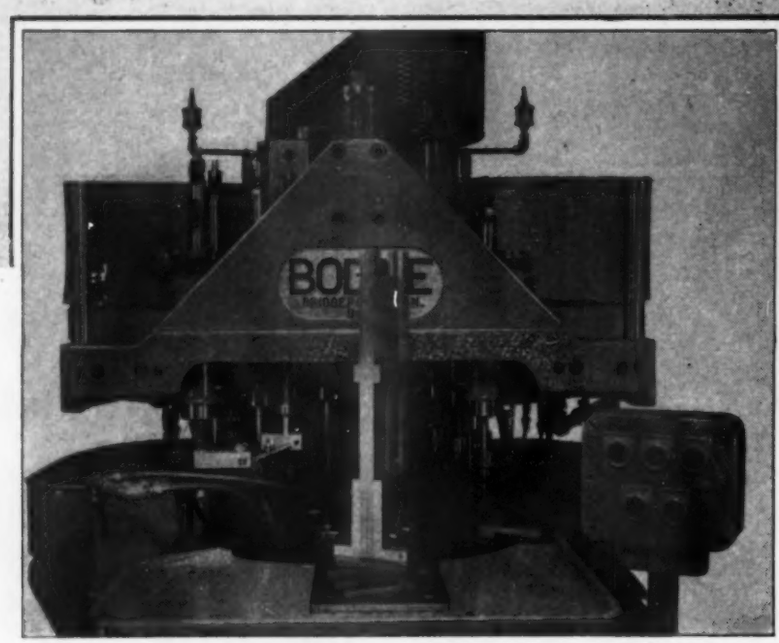
INTERNATIONAL DIVISION: MILWAUKEE 1

Here's why you get 'em "Two for a nickel"





At the Machine Tool Show this Bodine Model 42-30 Automatic Drilling and Tapping Machine demonstrated its speed as follows:

Drilled and tapped six 10-24 holes in a ¼" square steel Lock Spindle at the rate of 800 completed pieces per 50-minute hour . . . (9600 operations). There are 6 drilling and 6 tapping spindles to which the work is indexed on a horizontal dial. All operations are completely automatic, including the magazine feed and ejection.

This machine and your product can become the best of friends . . . working harmoniously with your production schedules . . . profitably with the cost sheets. Send us a sample part and blueprints for practical recommendations. Maybe you can get 'em two for a nickel!

THE Bodine CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

Do these false beliefs keep you from converting to aluminum?

(Below are *4 misstatements* commonly applied to aluminum. Have *you* made any of them?)

1. "Aluminum is not readily adaptable to my product"

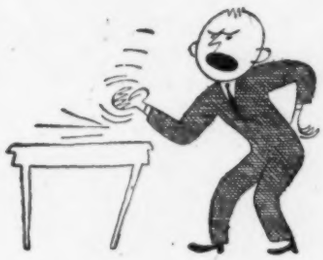
Fact: Kaiser Aluminum comes in a wide range of alloys to meet every type of manufacturing operation, and can be formed, drawn, spun, brazed or joined. It can be painted or polished, or finished in almost any way you choose. To select the alloy specifically suited to your requirements, simply call on a Permanente Metals' engineer.

2. "Aluminum costs too much"

Fact: While prices of other materials have steadily risen, aluminum is now *at the lowest price in history.* Figured *not* on a per pound basis, but on *unit cost,* aluminum prices (which include freight charges) compare favorably with those of any other metal or material. In addition, savings made on handling, finishing and shipping cut costs substantially.

3. "My competitors aren't converting. Why should I?"

Fact: Scores of manufacturers are speeding their products to market — by converting to aluminum. That's true of makers of general appliances, residential buildings, air conditioning units, heating and ventilating ducts, garage doors and window frames, office appliances and cabinets . . . *plus dozens more.* Their experience can help *you.*



4. "I can't be sure of a steady, long-term supply"

Fact: This is *especially* wrong *today.* For Permanente Metals now offers you a new source of aluminum . . . Kaiser Aluminum. In but a single year of operation Permanente Metals' mammoth aluminum plants produced 175 million pounds of plate, sheet, and strip aluminum. Almost as much as the entire industry produced in the most productive year before the war.

To the above facts add these . . .

Aluminum's resistance to corrosion cannot be matched. Nor can its strength per pound — it can give you the strength of steel at one-third the weight.

Aluminum's appearance can put an extra sparkle of *saleability* on many products, giving them a competitive edge.

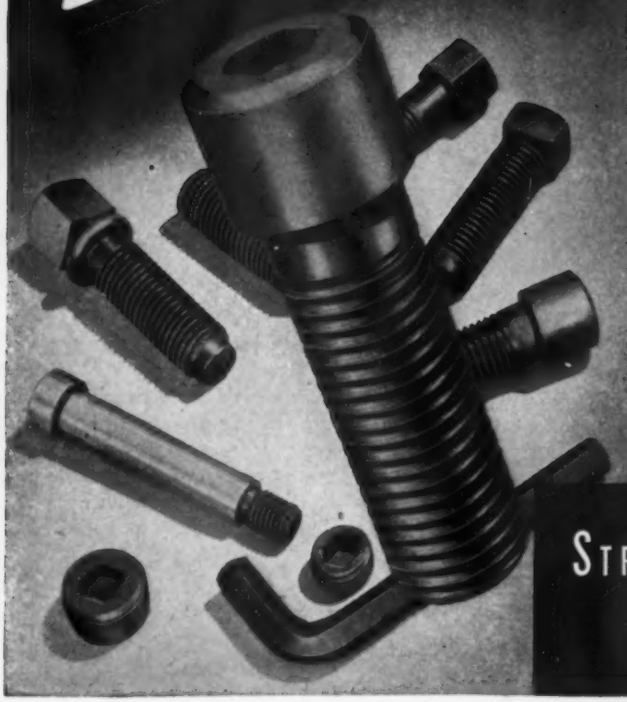
In the light of all these *facts,* can you afford NOT to investigate the possibility of converting to aluminum? Call any Permanente Metals' office and an experienced sales engineer will be on the job, for *you!*

Ready to serve you—today . . . **Kaiser Aluminum**

a Permanente Metals product

DISTRIBUTED BY PERMANENTE PRODUCTS COMPANY, KAISER BLDG., OAKLAND, CALIFORNIA . . . WITH OFFICES IN:
Seattle, Wash. Oakland, Calif. Los Angeles, Calif. Dallas, Texas Wichita, Kan. Kansas City, Mo. St. Louis, Mo. Atlanta, Ga. Minneapolis, Minn. Milwaukee, Wis. Chicago, Ill. Cincinnati, Ohio Cleveland, Ohio Detroit, Mich. Boston, Mass. Hartford, Conn. Buffalo, N. Y. New York City, N. Y. Philadelphia, Pa. Washington, D. C.

Mac-it ALLOY STEEL SCREWS



Greater strength, more compact design with SOCKET HEAD CAP SCREWS!

Mac-it Socket Head Cap Screws will give you added holding power and permit more compact design where necessary. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

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MANUFACTURED BY
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You, too, may have a water-soluble grinding problem.

Why not find out about

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LUBRICANT 1888

from the originators of grinding lubricants?

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Put Your Stop Watch on NICHOLSON EXPANDING MANDRELS

Test the time-saving possibilities of these widely used precision tools. Not infrequently time studies show operations can be completed in less time than was formerly consumed in looking for or turning a solid arbor. No parts to wear out and cause distortion. Sold singly or in sets; for bores ½" to 7". Bulletin 1043.

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Any MICROMETER 1" to 18" size trued and lapped square

Pearson Precision "Micrometer Lapping Fixture" gives your plant constant *exact check* on all micrometers. Any good toolroom man can operate it expertly. No disassembling of micrometer other than removing spindle. Laps micrometer in exact right angle with center line of spindle; and in perfect alignment with end of micrometer spindle. Also makes an excellent comparator. Saving an hour's rejects may more than pay for this fixture.

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MANUFACTURED BY **RED WING MOTOR CO., RED WING, MINN.**

STANDARD ENGINEERS NOTEBOOK

CALOL RPM

Calol Pinion Grease sticks on open gears

Because Calol Pinion Grease is extremely adhesive and flows back into place when displaced, it will not drip off and waste away from large open gears.

The tenacious lubricant film provided by this oil-like grease withstands high pressures and acts as a cushion under shock loads. It reduces to the minimum frictional losses caused by the sliding action of gear teeth and resists high temperatures.

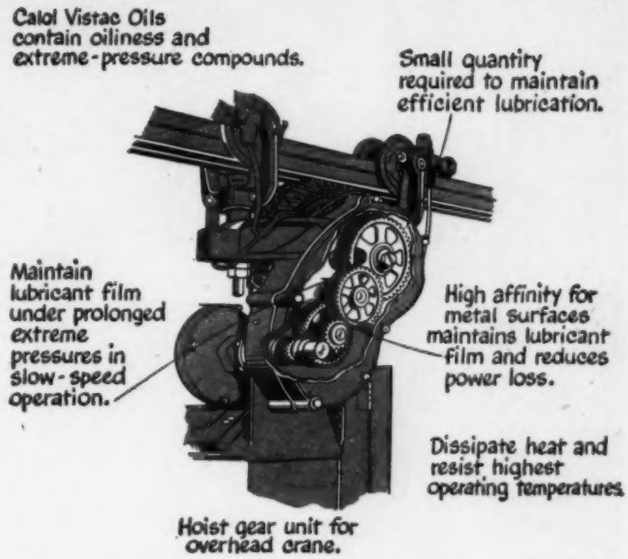
Calol Pinion Grease is also used on wire rope and the lightest grade is recommended for enclosed grease-lubricated gears.

It comes in four grades: 0, 1, 2 and 5. The heavier grades are increasingly more adhesive. In some cases they require heating for correct application.

For more information about Calol Pinion Grease and many other industrial lubricants, write for the free booklet, "Vital Protection for Industrial and Marine Equipment."

Calol Pinion Grease is black, adhesive – flows slowly back after displacement by pressure.
Light grade is recommended for enclosed spur, and herringbone gears.
Comes in four high-viscosity grades.
Cushions shocks and reduces frictional losses caused by sliding action.

Section of Pinion and Girth Gears on Rotary Drier.


Calol Vistac Oils contain oiliness and extreme-pressure compounds.
Small quantity required to maintain efficient lubrication.
Maintain lubricant film under prolonged extreme pressures in slow-speed operation.
High affinity for metal surfaces maintains lubricant film and reduces power loss.
Dissipate heat and resist highest operating temperatures.

Hoist gear unit for overhead crane.

Viscous and tacky oils keep tough film on gears

Heavy duty gears, such as industrial reduction sets, with forced-feed or gravity lubricators, sight-feed cups, bottle- or wick-oilers are safely lubricated with Calol Vistac Oils.

As the name "Vistac" implies, these oils are both viscous and tacky and have a high affinity for metal surfaces. They contain oiliness and extreme-pressure additives and provide a lubricant film of unusual strength. This film resists rupture even on slow-moving gears that develop extreme pressures over a wide area for a relatively long time.

In addition to being outstanding gear lubricants, Calol Vistac Oils are excellent for air hammers, rock drills and other air tools. They rapidly carry away heat, resist high temperatures, stay fluid at low temperatures and atomize quickly. There are six viscosity grades of Calol Vistac Oils:

9X (SAE 10), 14X (SAE 20), 19X (SAE 30), 28X (SAE 40), 36X (SAE 40), 45X (SAE 40).

Trademarks "Calol," "Vistac," "RPM," Reg. U. S. Pat. Off.

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Colo.; Standard Oil Company of Texas, El Paso, Texas.

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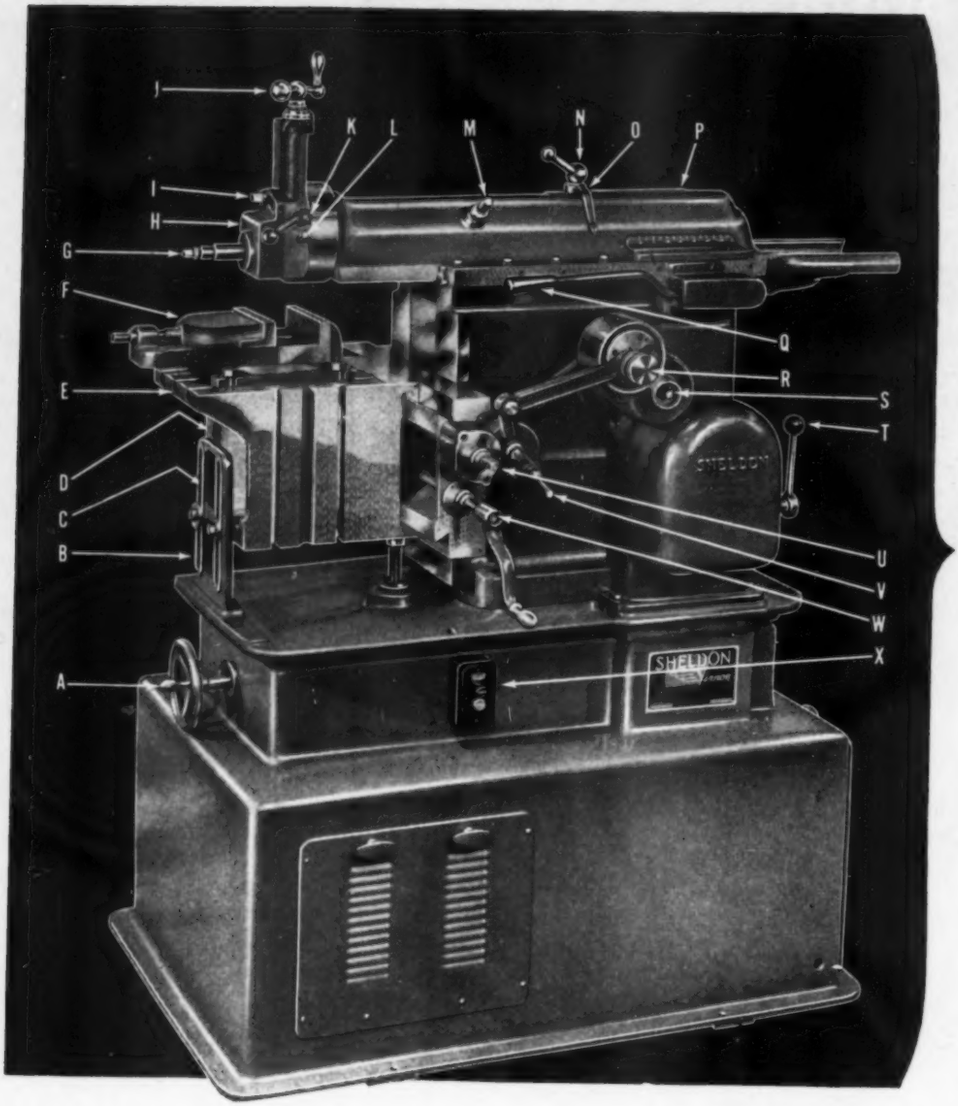

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C—Table Protractor (Not Shown)
D—Cross Rail Lock
E—Table
F—Vise
G—Tool Holder
H—Clapper Box
I—Clapper Box Lock
J—Tool Slide Handle
K—Tool Slide Lock
L—Tool Slide Swivel Lock
M—Ram Positioner
N—Ram Clamp
O—Stroke Indicator
P—Ram
Q—Clutch
R—Feed Adjustment
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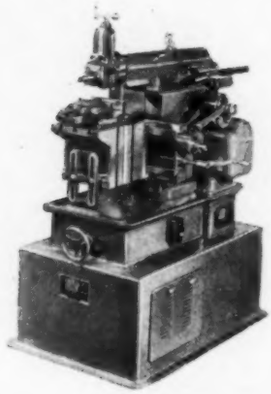

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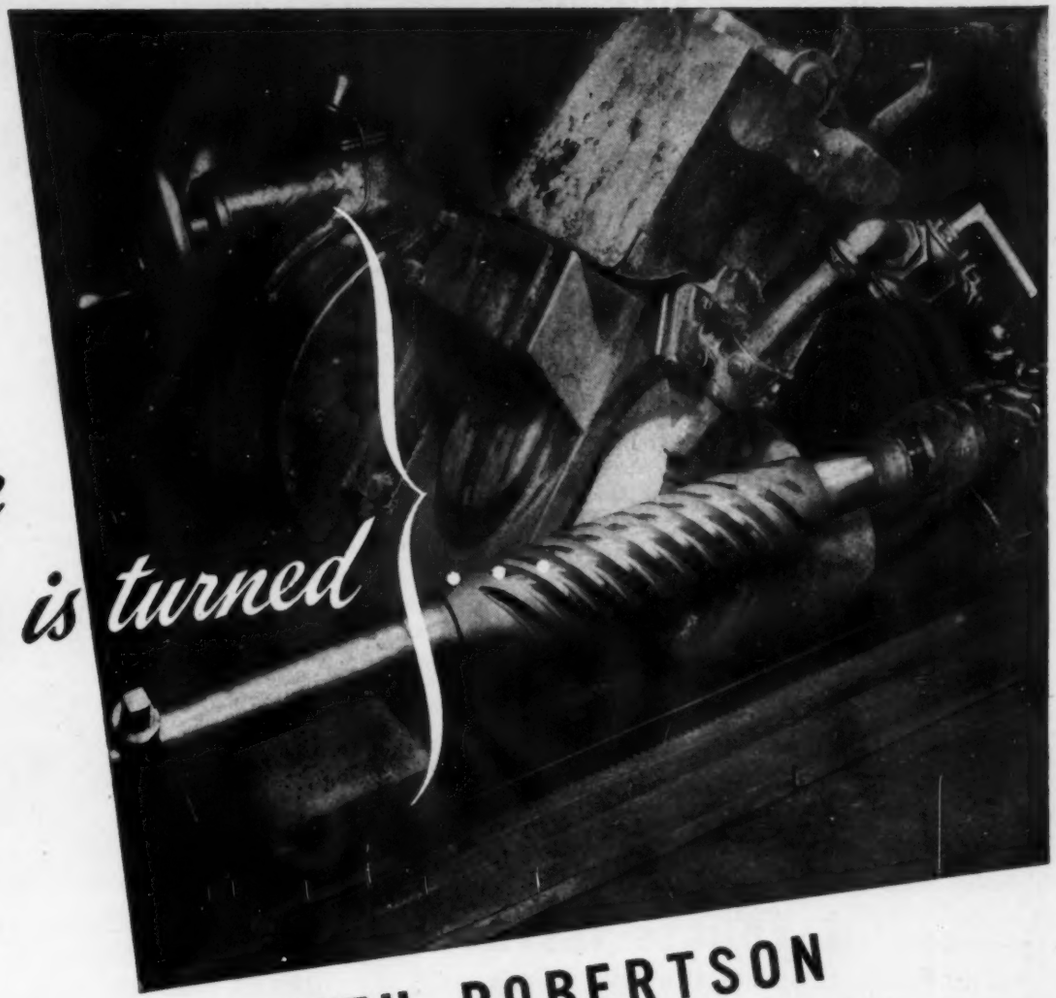

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. . . WITH ROBERTSON COOL-CUT WHEELS

Accurate, fast production, without progressive lead error and with finishes equal to production standards . . . that's what you get when you grind worms with a Robertson Cool-Cut instead of a conventional wheel. The cool-cut type of wheel, with its revolutionary "open" structure and "clawing" action, provides proper space for chip clearance. Thus, more stock is removed per pass and less dressing is required . . . resulting in high production and lowered wheel costs.

For grinding worms of all kinds, try a Robertson 20″ x 5/8″ x 8″ RA463 JV or a Robertson 16″ x 9/16″ x 8″ RA542 JV. Daily, these wheels are finishing pieces in the fewest possible cuts, at high work-speed and with great accuracy. They have smashed all previous records for grinding hardened triple-lead worm shafts.

For worm or gear grinding . . . for *all* the tough grinding jobs . . . you'll find that a precision-built Robertson Cool-Cut does the trick.

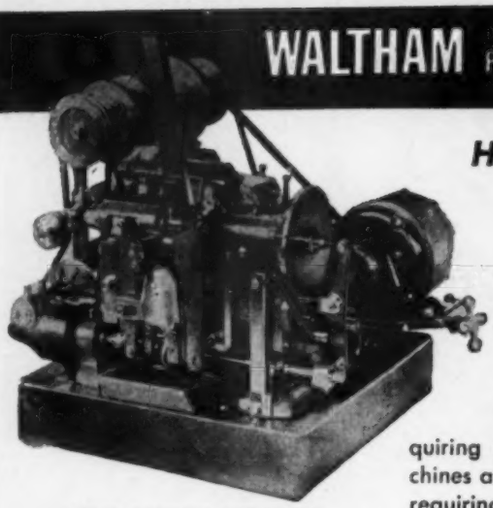
Send for your free copy of the booklet "How to Buy Production Time." It's full of useful information on how to increase production in your grinding department.

ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Manufacturers of Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

WALTHAM PINION & GEAR CUTTING MACHINES

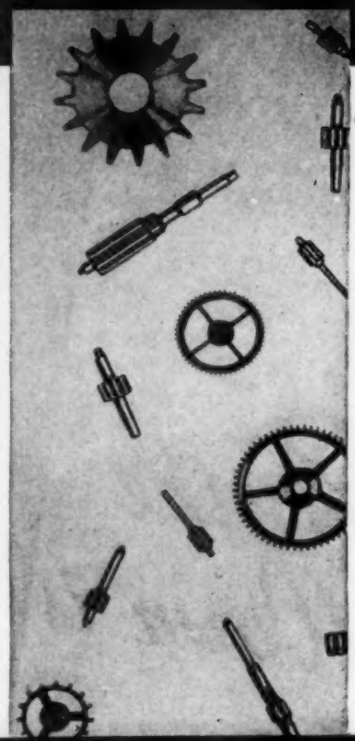


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
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The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE
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Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

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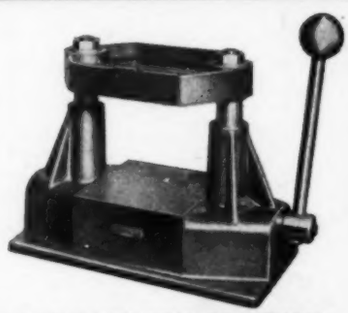

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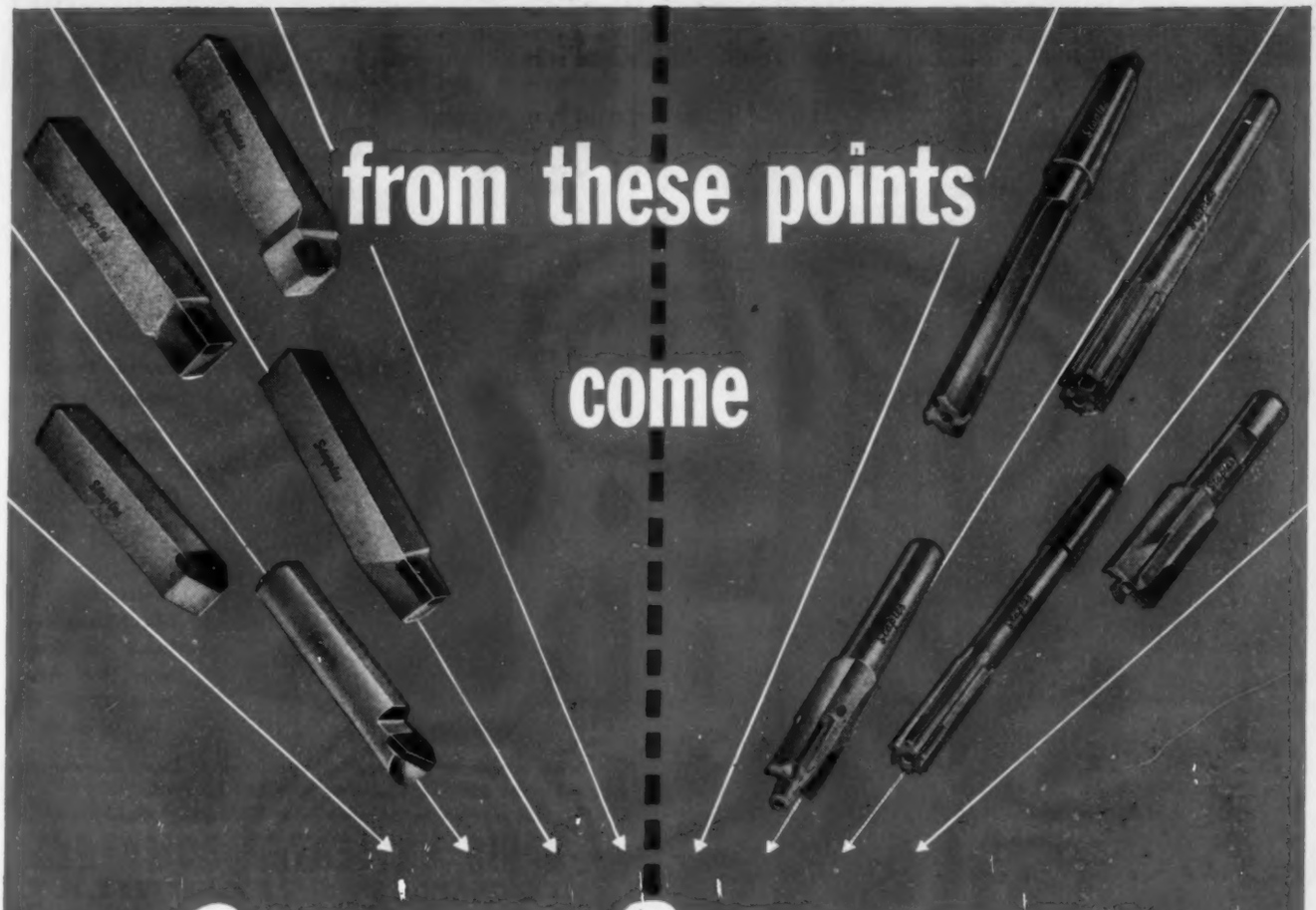

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CEMENTED CARBIDES

Tool up for higher production with Staples Carboloy-tipped Tools. Now, Staples offers one of the most complete high-quality lines of carbide-tipped tools available today.

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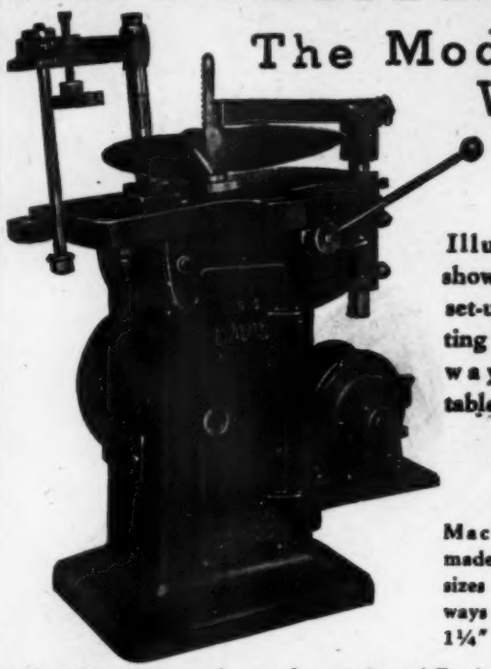

Illustration shows typical set-up for cutting taper keyway with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

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Let our engineer study your keyseating problems.

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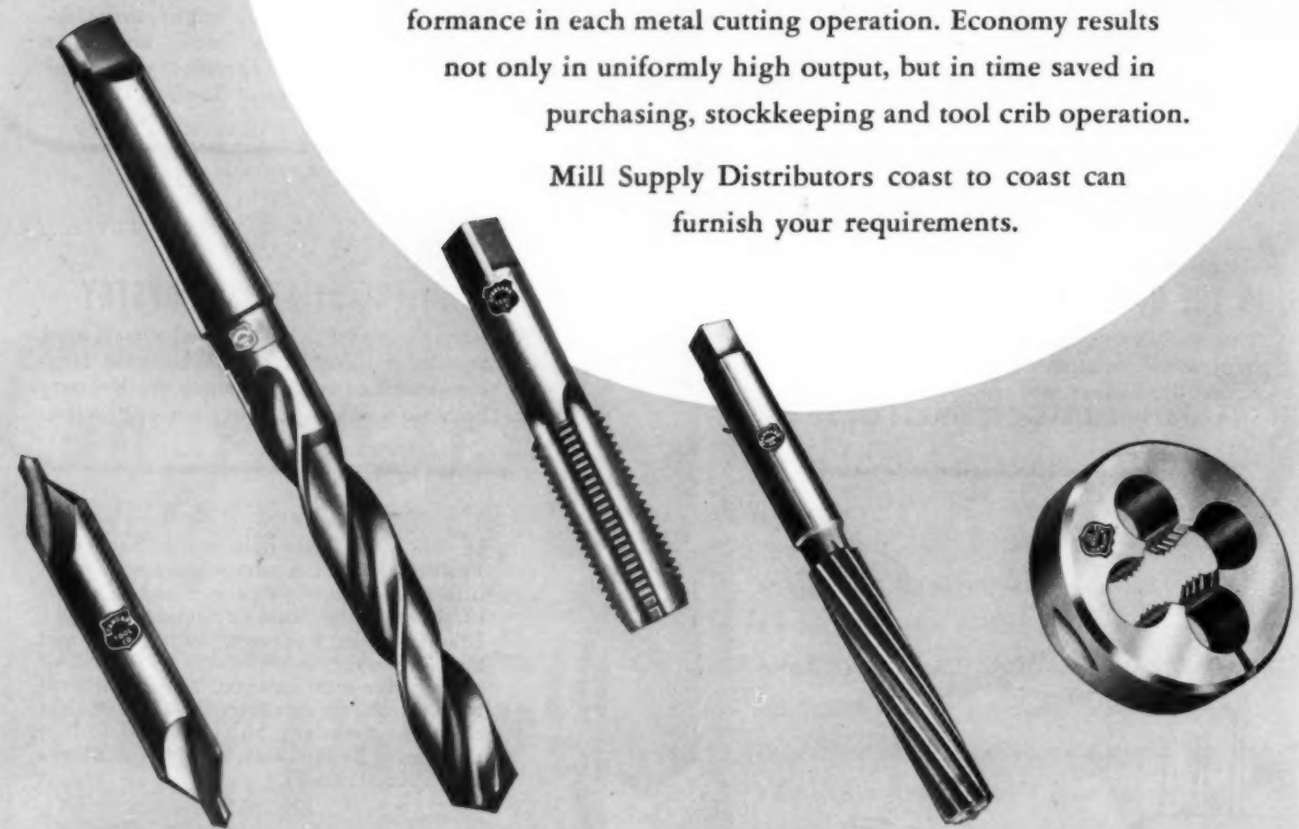
By standardizing on Standard Shield Brand Tools you get uniform performance in each metal cutting operation. Economy results not only in uniformly high output, but in time saved in purchasing, stockkeeping and tool crib operation.

Mill Supply Distributors coast to coast can furnish your requirements.



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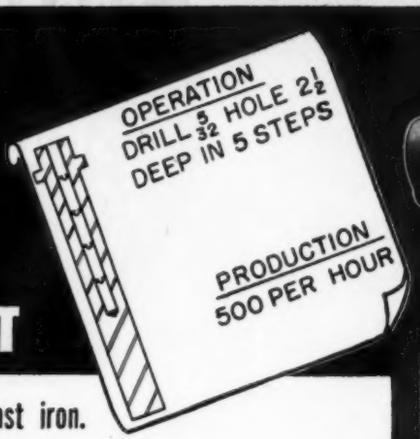
Avey Automatic METHOD No. 8

THE Avey CAM FEED UNIT



No. 1 Size—1/2" capacity in cast iron.

No. 2 Size—7/8" capacity in cast iron.

Designed for DEEP HOLE DRILLING—(step method)—using rotating table—each station drilling an additional depth. Number of station required depends on depth to be drilled.

Deep hole drilled in time required to drill one-fifth of depth — free loading time and five times single spindle production.

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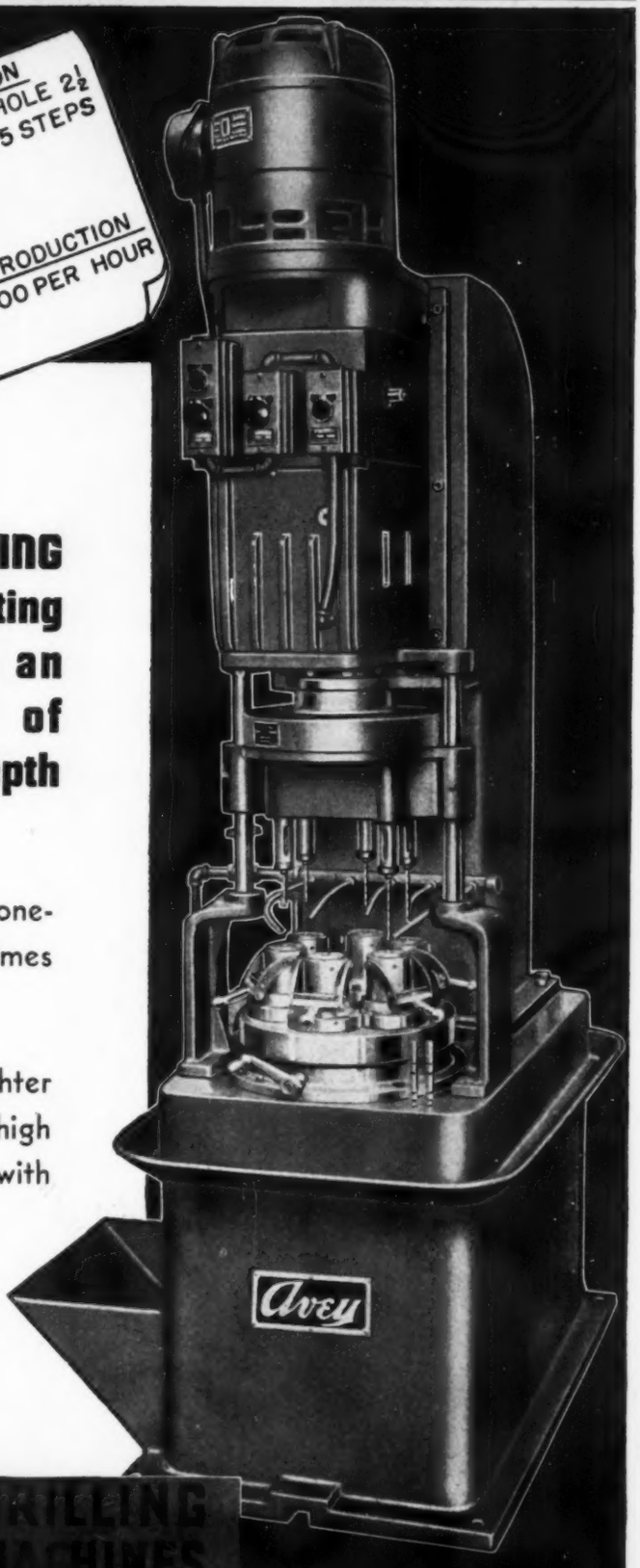

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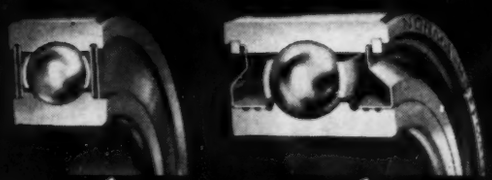

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BORITE—for all kinds and classes of steel grinding.

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"FLUIDMOTION", an exclusive J & S development, automatically blends any combination of angles and arcs in **one** continuous motion, with **one** setting, using **one** *handle*. Produces clean, precise form without tool or chatter marks. Available in models C, E and F . . . also the Form Master, an accurate lower priced dresser. Send for folder.

Fluidmotion **FEATURES**

- *automatic centering*
- *.0001" accuracy*
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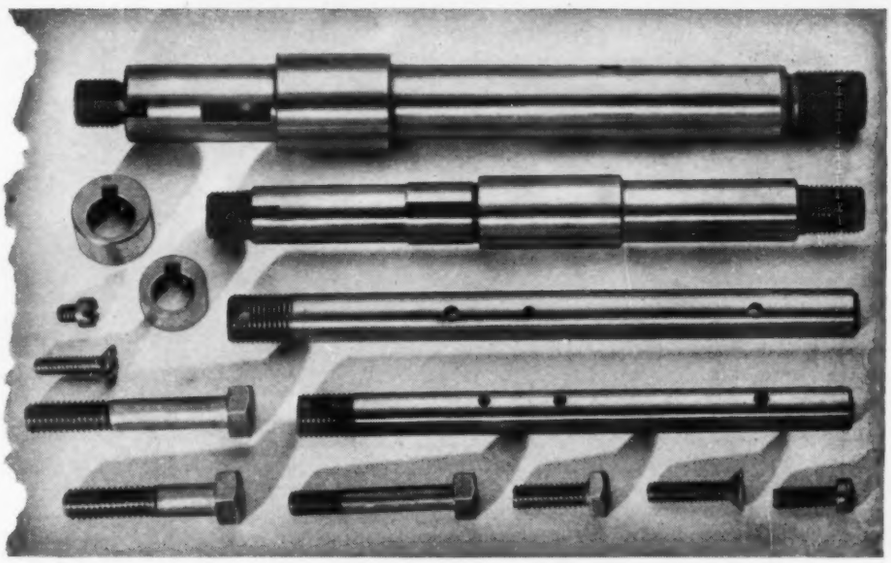

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THESE end cutting tools were specially designed for high production operation. They are form ground all over, and the original forms are maintained throughout the entire life of the tools.

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Conforming to the Weldon usual high standard of quality these end cutting tools are exceptionally fast-cutting, accurate and dependable.

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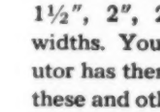

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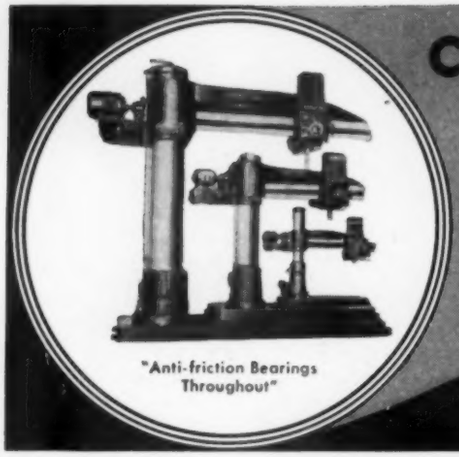
ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.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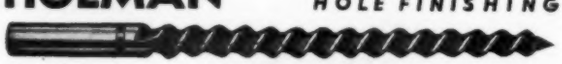

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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For liquid heat treating baths, soft metal melting, etc.

The High Speed Full Muffle Furnace quickly attains a temperature of 2400° F., and is designed for High Carbon and Alloy Steels.

"BUZZER" Rectangular Heat Baths meet the increasing demands liquid Heat Bath Furnaces and Metal Melting. Also made in round pot furnace type.

Send for the "BUZZER" Catalog showing full line of Gas Furnaces, Burners and other equipment.

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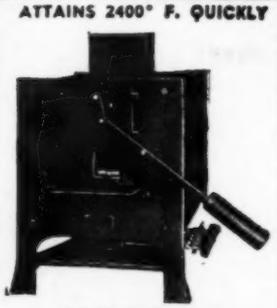

Full Muffle Furnace (Bench Type)

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This Parker Tube Fitting makes Free Flow systems possible

It takes *tubing* to achieve Free Flow. Tubing can be bent . . . can be connected without creating pockets that cause turbulence. Fewer fittings are required—resulting in fewer chances of leaks.

With PARKER Tube Fittings there's no threading on the tubing. You can use light or heavy tubing. Connections are pressure-tight—protected against leakage, vibration and shock—the result of **precision** manufacture.

With no threading on the job—installation and removal are quick and easy.

For simplified, Free Flow systems, use tubing with PARKER Fittings and Valves. And remember, *every* PARKER Fitting is a *coupling*.

Let PARKER work with you on your systems to carry liquids or gases, under high or low pressure.

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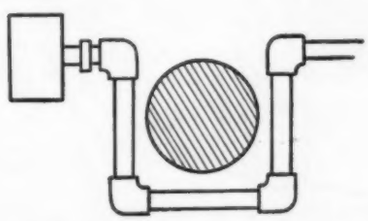
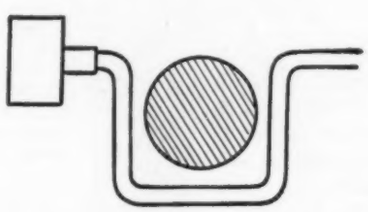
TUBE FITTINGS • VALVES

FREE FLOW— a comparison

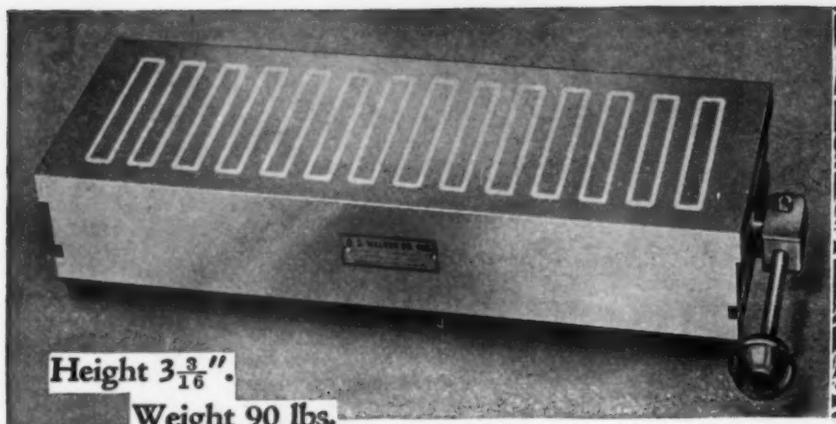


OLD METHOD—Each connection threaded—requires numerous fittings—system not flexible or easy to install and service. Connections not smooth inside—pockets obstruct flow.



MODERN METHOD—Bendable tubing needs fewer fittings—no "threading on the job"—system light and compact—easy to install or service—no internal pockets or obstructions to free flow.

Write for interesting booklet "Fluid Power".



Outstanding development in the machine tool industry—the new WALKER PERMO CHUCK—the lightest permanent chuck ever produced. Weight only 90 pounds (6" x 18"). It is only 3-3/16" high.

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Original Designers and Builders of Magnetic Chucks

These are the NEW

DUBLIFE Plug Gages with

COLORED *Plastic* (INSULATING) COLLETS

GREEN for "GO"

RED for "NO GO"

Colored Collets identify plug instantly. Weight is reduced. Plugs securely locked without marring or scratching plugs as with metal collets.

New Light Weight Handle with these collets.

DUBLIFE

In one and same balanced handle, 2 "GO" and 2 "NO GO" Plugs. Tolerances to .00002. Reverse either plug when wear shows and you have a new, fresh gage. Time saving! Gage saving! Money saving! It is to your advantage to know about DUBLIFE GAGES with colored plastic collets and light weight handles. Send for complete catalog showing DUBLIFE and A. G. Design Gages.

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Save Hands Speed Production with —

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Pres-Vac Safety Feeder

KEEP workmen's hands out of Danger Zone. Use PRES-VAC Safety Feeders to keep hands safe, improve quality and speed production. Pres-Vac acts on trigger-vacuum principle. Picks up—drops—material instantly. Uses compressed air, 10 to 45 lbs. pressure.

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STOPS LOSSES

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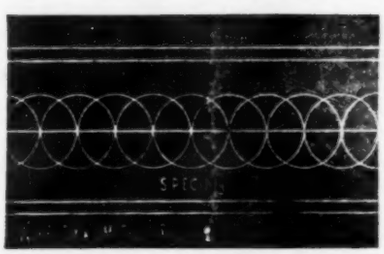

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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THE WORLD'S FINEST MULTIPLE SPINDLE

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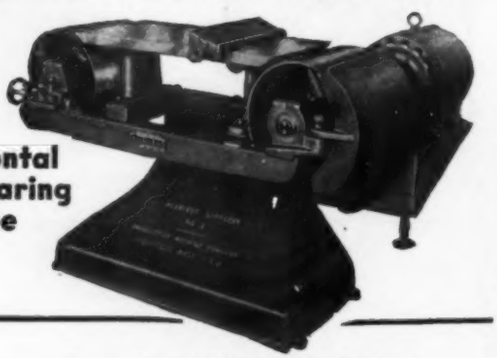

Horizontal Ball Bearing Type

. . . for straight-grain finish at faster speeds and lower costs

These machines eliminate hand sanding and filing with resulting economies in time and material. Cutting action is fast and uniform because all points on the abrasive belt travel at the same rate of speed. Furthermore a straight-grained finish is attained with all the advantages which accrue.

Ideal for grinding and sanding flat surfaces.

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- Removable Gauge and Dust Hood
- Easily Adjusted abrasive belt
- Dynamically balanced drums
- Self-aligning ball bearings
- Available for belt or direct motor drive

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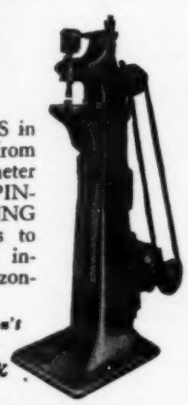


THE GRANT MFG. & MACHINE CO.

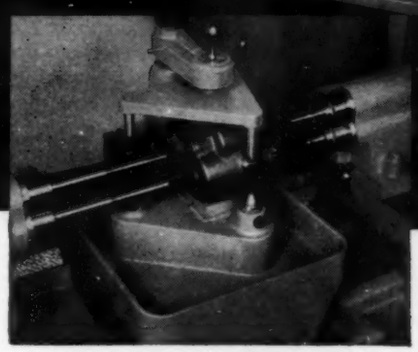
85 Silliman Ave., Bridgeport, Conn., U. S. A.

MADE TO ORDER . . . FROM STANDARD UNITS

Ex-Cell-O Way-Type Precision Boring Machines Offer Specialized Multiple Operation at Low Cost

XLO

EX-CELL-O PRECISION



Illustrated here is an Ex-Cell-O Two Way Precision Boring Machine designed for boring holes in cast iron automotive transmission cases. To meet production requirements it was necessary to bore the holes at both ends at the same time.

Above: Special cluster spindles are required here because of close center distances of bored holes. Because boring bars at left are long and slender the ends are further lengthened to engage pilot bushings in the fixture.

Ex-Cell-O Way machines are made to order for work like that illustrated here. They are built up from standard way units that can be operated simultaneously or in sequence as the work requires. Way machines do the work of special machines, but the use of standard units keeps the first cost low and, as production requirements change, the units may be rearranged to accommodate different work. Ex-Cell-O One Way Precision Boring Machines are especially suitable for heavy or awkward work. Two Way Machines accommodate awkward and long work pieces and save time by boring from both sides simultaneously. Three and Four Way Machines are particularly suitable for boring holes perpendicular to one another. An important feature of Way Machines is that multiple operations are performed from the same work locating points, with only one handling of the parts.

machine tools mean high production . . . high production means low unit cost . . . low unit cost means a higher living standard for everyone!
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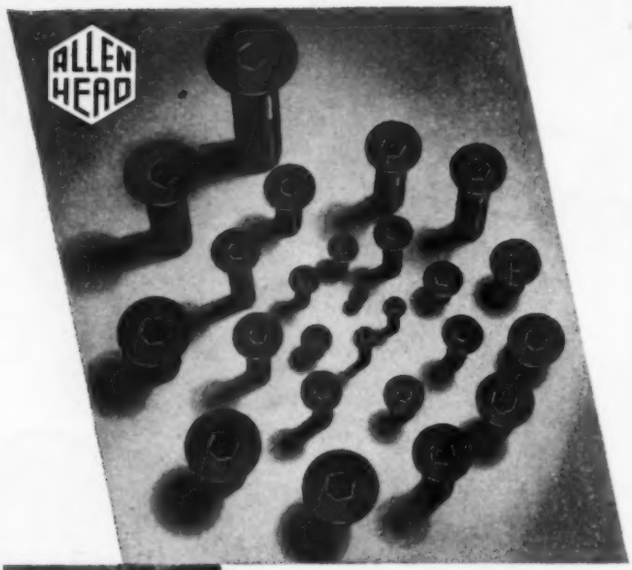

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CAP SCREWS

For perfect countersink-fit; positive wrenching — and more!

(1) Flush top surface with no gap between screw head and surrounding metal.

(2) Extreme rigidity of grip, because angle of head helps lock screw in place by drawing down on a conical surface.

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(5) Positive engagement of hex key transmits power for tightest of set-ups without slipping, reaming or side play.

(6) Maximum strength of screw itself assured by *"pressur-forming"* of special-analysis ALLENOY steel. Threaded to a high Class 3 fit.

(7) Speed in assembly provided for by use of Allen hand drivers and key blades for power drivers.

Order of your local ALLEN Distributor, — or ask him for samples and engineering data for preliminary try-out. Get *proof* that these screws perform as dependably as Allen Hollow Set Screws and Socket Head Cap Screws.

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Choice of experienced SCREW MACHINE MEN

The makers of H & G Insert Chaser Die Heads learned from an independent survey the die head preferences of leading production engineers and operators. H & G was number one by a substantial margin. Here are the reasons for this preference direct from reports: *"simplicity of construction . . . positive cam action."* Another, *"ease with which chasers are changed . . . set to proper pitch diameters . . . quickly resharpened."* (This reason occurred again and again.) From another report, *"they are ideal for threading close to shoulders."* Another, *"interchangeability of insert chasers for different types of die heads reduces inventory and is a distinct advantage."* Another writes, *"more threads per grind and more parts per hour for man and machine because of less down time."* And this one if you will pardon us): *"we like the cooperation of the company."*

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SPEED CALCULATOR

This handy device eliminates laborious calculations and gives the proper speeds for different materials for all diameters. FREE if requested on business letterhead. Otherwise, 15c.

Simple
Strong
Accurate

Sizes and styles for all machines on which threads are cut. Write for literature.

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Manufacturers H & G General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines, Feed Fingers

THEY'RE NEW!

L-W *Medium Duty* 4-JAW INDEPENDENT CHUCKS FOR SMALL LATHES

The bodies are semi-steel castings. Ground surface on face and outer edge. Steel jaws. Hardened and ground steps. Heat-treated steel screws.

RUGGED 8" MEDIUM DUTY

complete with wrench **$21.00**

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Rough adapter plate for 8" Medium Duty Chuck **$1.50**

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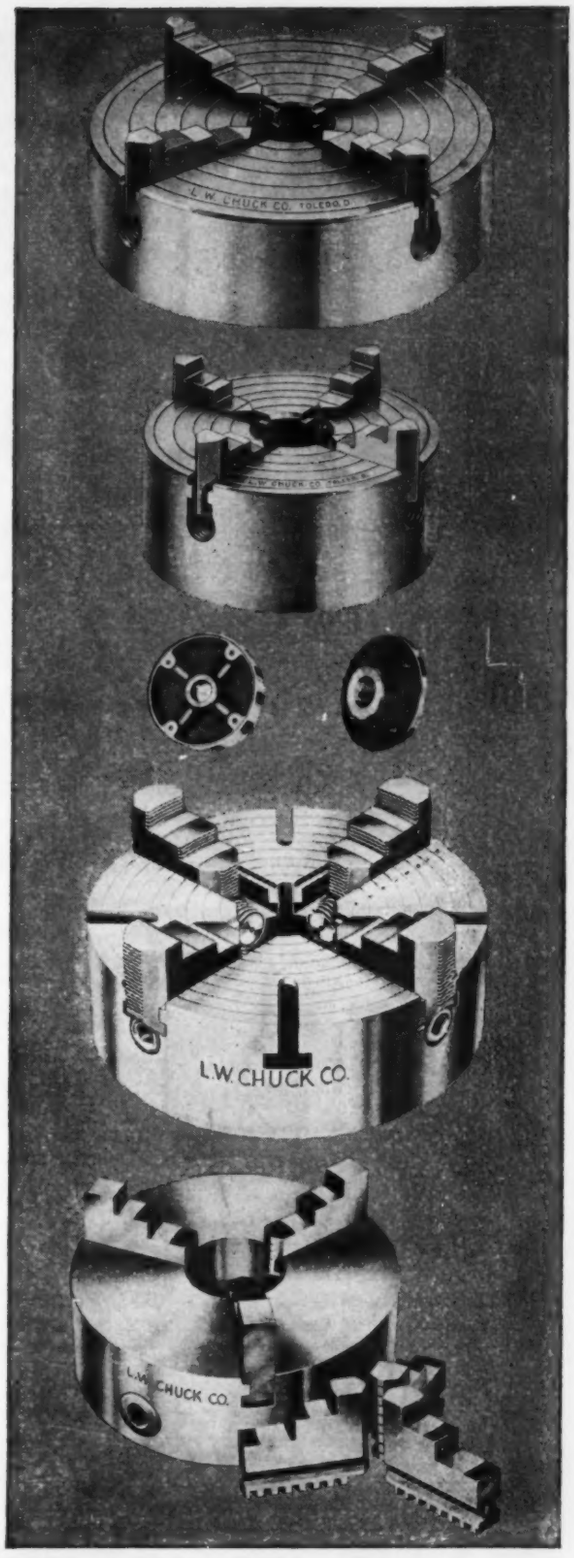
Sturdy, accurate. Hardened steel reversible jaws. Semi-steel body. Wide gripping surface, oversize, tough nickel steel screws, steel thrust bearings assure durability.

10"	$39.35	14"	$50.40
12"	$43.85	16"	$66.25
	18"	$87.75	

3-JAW UNIVERSAL LATHE AND SCREW MACHINE CHUCK

For light or heavy duty work. Guaranteed to run true. Hardened steel reversible jaws. Semi-steel body. High grade alloy geared scroll and steel pinions.

6¼"	$45.00	7½"	$55.00	10½"	$83.35



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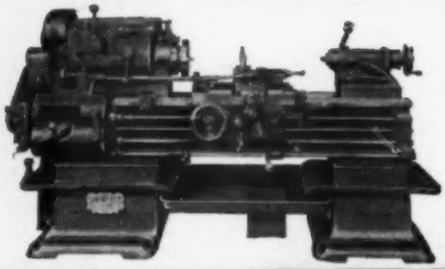

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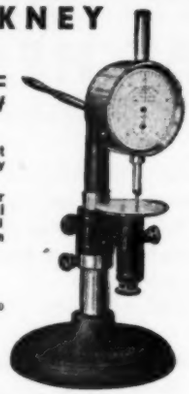

for rigid inspection of a wide range of parts . . .

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Use of standard blocks made possible by raising or lowering table increases capacity to take material up to 2" in height. Graduated to read to .001 inch: height 9¾"; weight 5 lbs. 1¼ oz.; depth from frame to spindle 1⅝".

Full details on request

Can be supplied with sliding head and table: also on a stand with throat 3" deep.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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STUART *service goes with every barrel*

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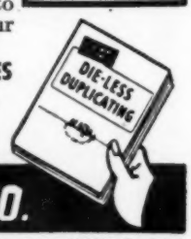
"DIE-LESS DUPLICATING" Often Does it Quicker WITHOUT DIES

This is but one example of how DI-ACRO precision machines—Benders, Brakes and Shears—can accurately and economically duplicate a great variety of parts, pieces and shapes, without die expense. **Write for Catalog—"DIE-LESS DUPLICATING"**

◀ DI-ACRO is pronounced "DIE-ACK-RO".



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Cuts time up to 75%
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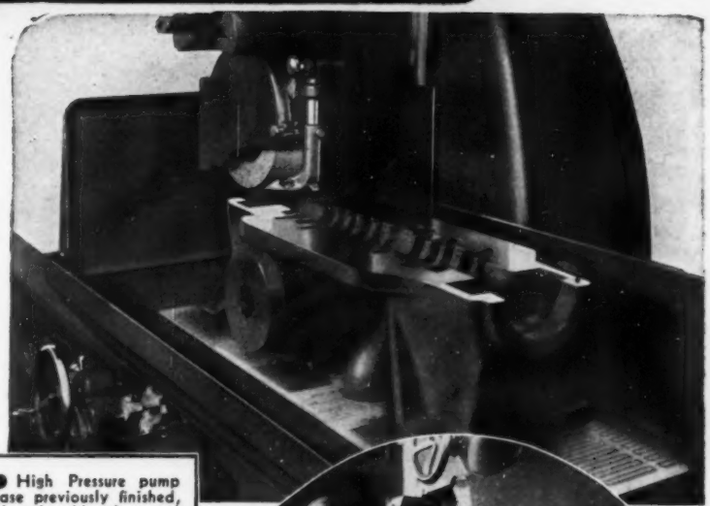
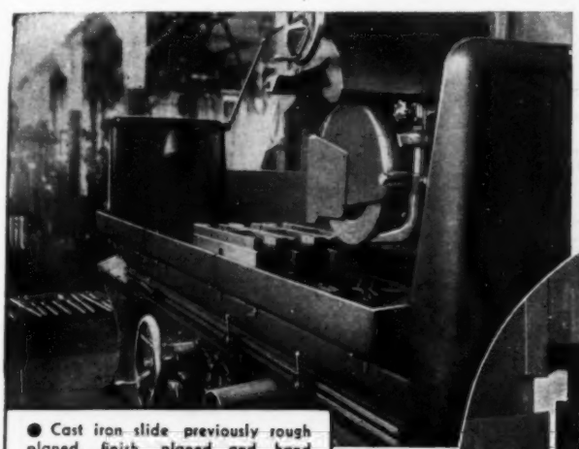
Examples: Time on pump case reduced from 40 hours to 4 hours . . . . . Time cut from 12 hours to 3½ hours on slide castings . . . . . Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this make a big difference in manufacturing cost. To see what Mattison High-Powered, Precision Surface Grinders can do on your work, send us blue prints for production estimates.

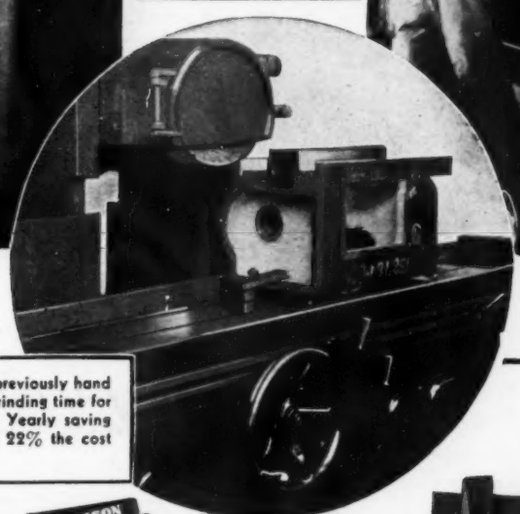




● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 80% savings in time. Finish planing and scraping operations eliminated.

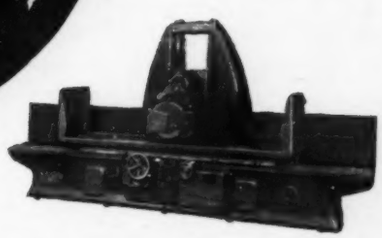
● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".

● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.

Write for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.



Mattison High Powered Precision Surface Grinder. Table Sizes: 12" to 36" wide, 36" to 192" long.

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★ Can thread round, square and inserted chaser dies

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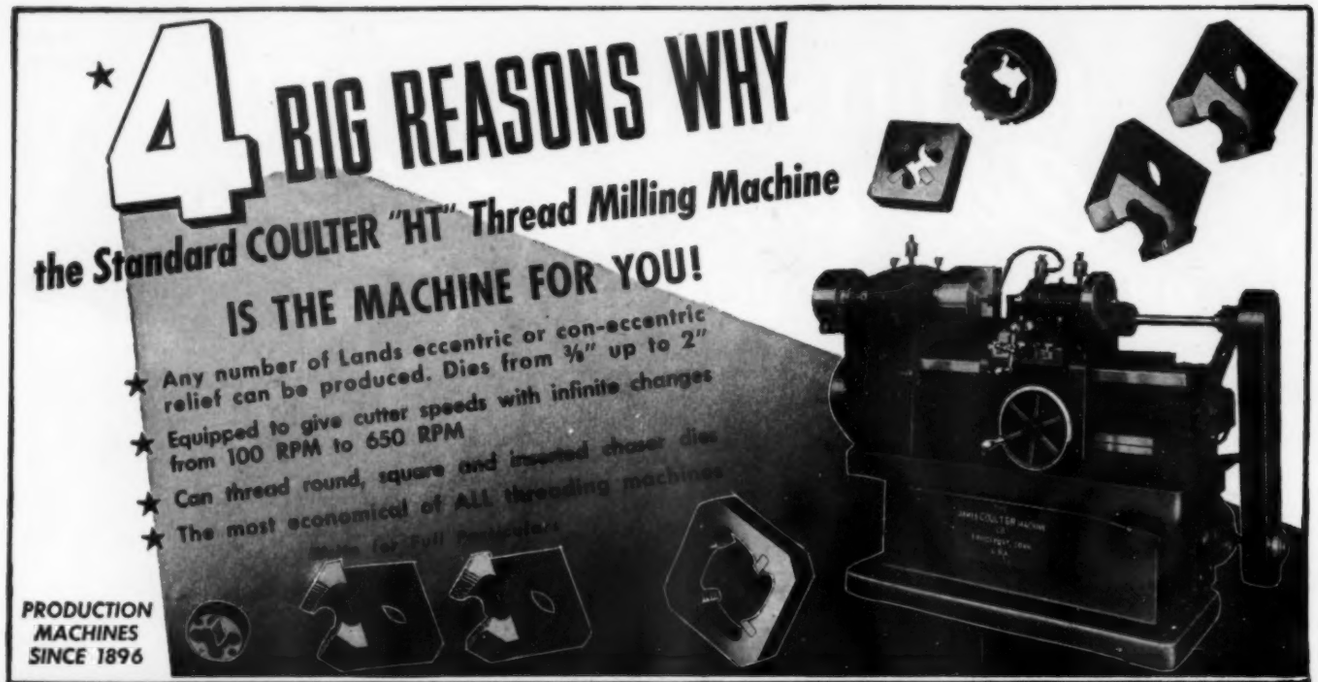

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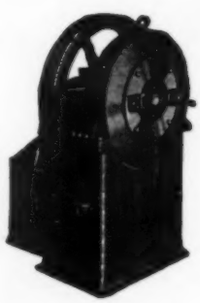

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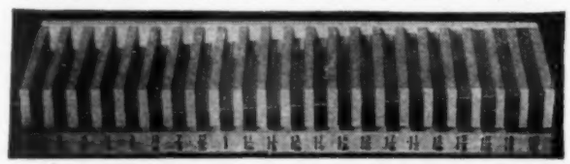

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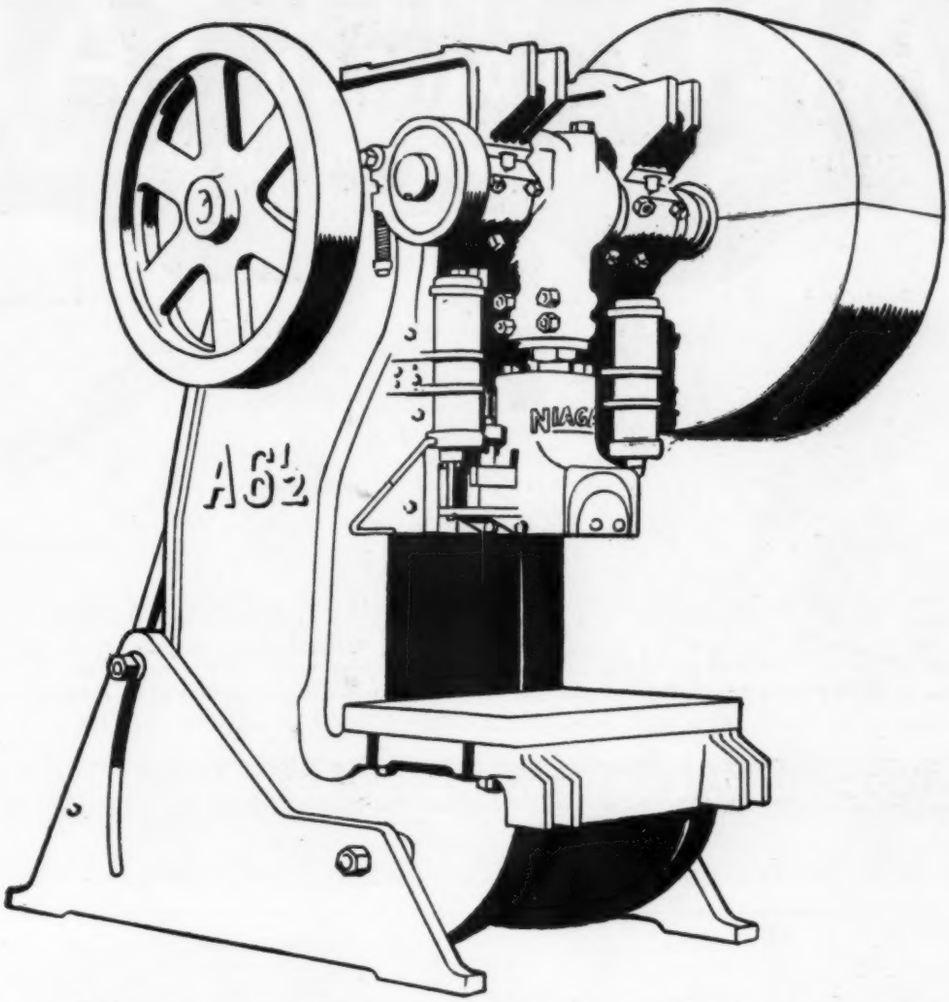

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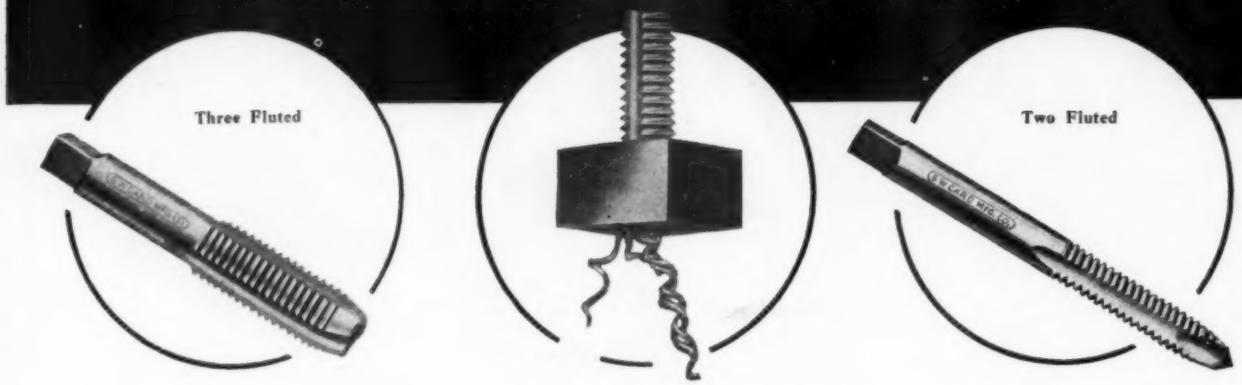
for free, accurate thread cutting in deep holes



Designed for tapping deep through holes or blind holes drilled deeply enough for chip clearance at bottom of hole. Cutting is done by the first few threads milled at an angle. Chips are forced ahead of tap, preventing chips clogging in flutes, thereby increasing strength of tap and minimizing chances of breakage.

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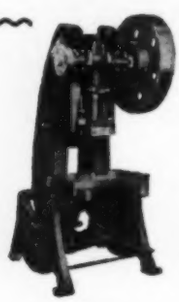

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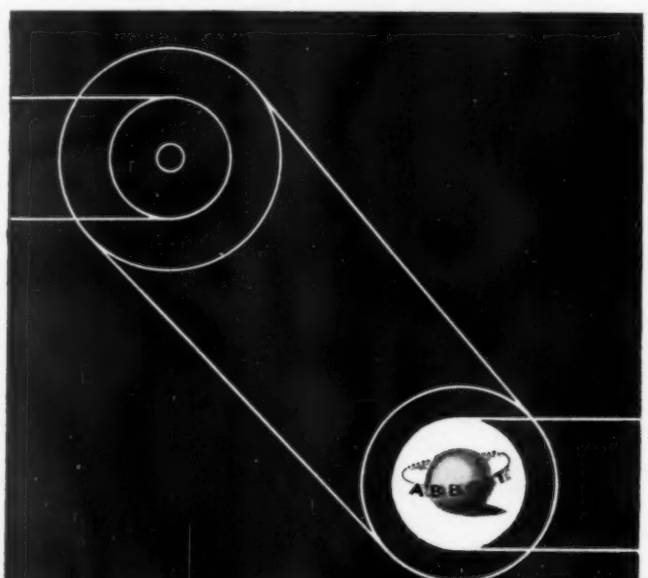

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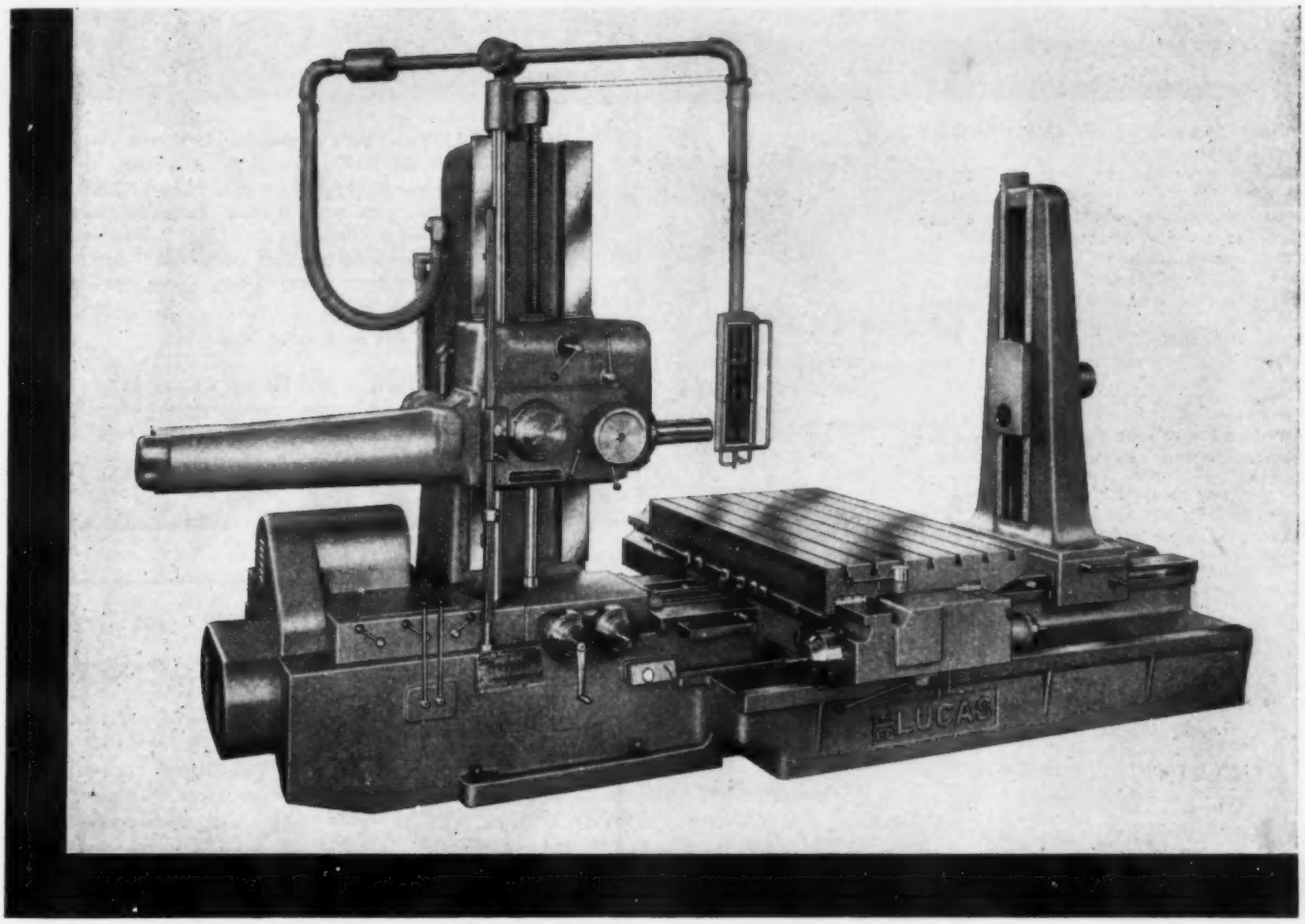

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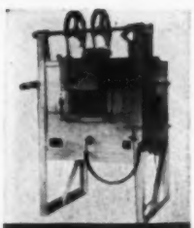
TODAY — providing the most advanced types of controlled-atmosphere furnaces

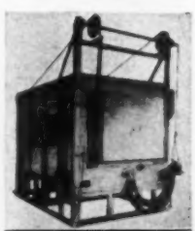
Modern machine tools call for top-quality cutting tools Get 'em with "Certain Curtain" furnaces

with PRECISION Control of Atmosphere

Here are furnaces of the type that bring customers back for more. Plants who started with one or two are now using 6, 8, 29, 56 and over 100 "Certain Curtains" in their various divisions. And why? Because precision control of furnace atmosphere DOES give them better hardening at less cost—and because "Certain Curtain's" exclusive design DOES give that kind of atmosphere control.



TOOL HARDENING



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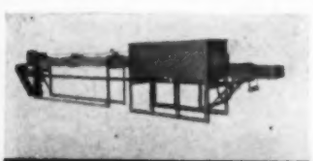
A quick summary:

1. Spoilage and atmospheric attacks are a thing of the past.
2. Heat-treating production substantially increased—often 50% per man per furnace.
3. Working life of tools markedly increased.
4. Reduced cost of finishing—often eliminated entirely.
5. Dimensional change controlled.
6. Dies hardened with beautiful finish.
7. Sintering, copper brazing, annealing, carbide tip brazing, tempering done clean and with maximum thermal effectiveness.

You may have the finest machines in the world; then it all boils down to how good the working qualities of the tools are. "Certain Curtain" atmosphere control enables you to apply the temperature and timing that will give maximum working qualities to steel; resulting in faster cutting; more cuts between grinds; more production per machine.



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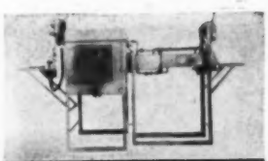

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Essentials of Furnace Atmosphere Control

All types of atmosphere available.
Consistent uniformity free of fluctuation.
Ability to vary on a known basis.
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Non-contaminating Entrance Seal.
Work completely and positively enveloped.
Ample volume of prepared atmosphere.

"Certain Curtain" has all!

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VALVAIR Solenoid Valves

Diagram shows double-acting air cylinder operated by Valvair 4-way double solenoid valve.

DEPENDABILITY — That's outstanding in Valvair performance. Solenoids are Stallite-welded to resist wear; do not mushroom. Standard Valvairs have operated over 2,000,000 times at 100 lbs. with never a leak. *Exclusive features.* Patented basic design eliminates metal seats; non-corrosive (cast bronze body, stainless steel parts); full pipe area used with minimum drop. 2-way, 3-way, 4-way types. Get full details and prices.

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THE V & O Press Co.
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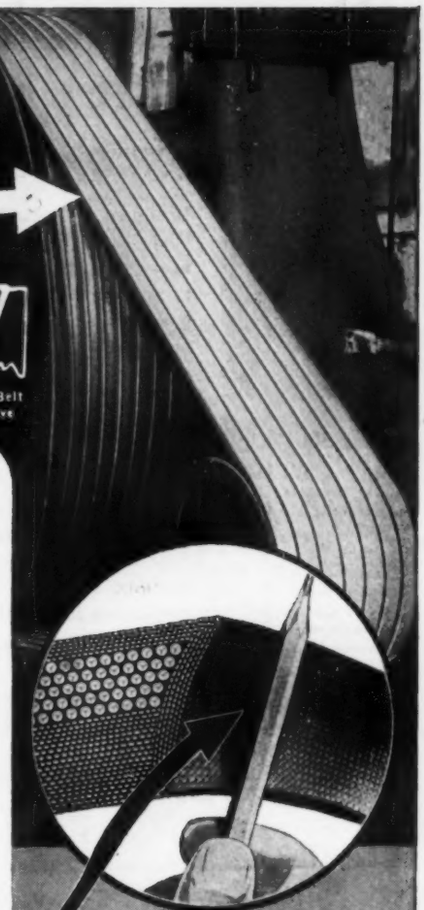
One Glance Tells You that

Only the SIDE of a V-Belt TOUCHES the Pulley

Diagram of V-Belt in Sheave Groove



The *SIDE* Does ALL the GRIPPING That's Why it *GETS the WEAR!*

One glance at a V-Belt in its sheave shows you that only the sides of the belt *touch the pulley.* Every ounce of load the V-Belt carries must first be picked up by the sides. The sides do all the *gripping*—they get all the *wear* against the sheave groove wall. They pick up the load. They transmit that load to the belt as a whole. Then, once again, the sides—and the sides *alone*—grip the driven pulley and deliver the power to it.

Naturally, this explains why you have always noticed that the sidewall of the *ordinary* V-Belt is the part that *wears out first.*

★ *Now See How the Patented CONCAVE SIDE SAVES Sidewall Wear—Lengthens Belt Life!*

Because the life of a V-Belt depends, first of all, on the sidewall, it is clear that anything which prolongs the life of the sidewall will lengthen the life of the belt. The simple diagrams on the right show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the *middle* of the sides. They show also why the Patented Concave Side greatly reduces sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

★ *Longer Sidewall Wear* Is MORE IMPORTANT NOW Than Ever Before!

Now that Gates *SPECIALIZED* Research has resulted in Super V-Belts capable of carrying much heavier loads—up to 40% *higher horsepower ratings* in some cases—the sidewall of the belt is called upon to do even *more work* in transmitting these heavier loads to the pulley. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important NOW than ever before!

4710

The CONCAVE SIDE is a GATES PATENT

Straight Sided V-Belt

Fig. 1

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

Fig. 1-A

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Fig. 2

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley.

Fig. 2-A

No bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

THE GATES RUBBER COMPANY DENVER, U. S. A., "World's Largest Makers of V-Belts"

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

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How to use infrared for better results in surface-finishing

Solves industrial heating problems in such fields as:
paint drying
metalworking
wood finishing
foundry molds
paper, plastics, ceramics, etc.

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by JAMES D. HALL

Advisory Engineer, Westinghouse Electric Corporation

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THIS up-to-date manual brings you a better knowledge of the tremendous potentialities of radiant heat—explains the advantages of infrared over the other older types of heating—provides you with numerous pointers and suggestions for adapting infrared to meet the specific requirements of your own production processes. It fully covers the use of the incandescent lamp as a source of infrared radiation, and shows you workable solutions to many specialized problems of application. In addition, the book covers various domestic and miscellaneous uses of infrared radiation, and discusses such timely topics as the effect of infrared on the human body, infrared glass filters, gas-fired infrared generators, and many others. The Appendix contains an extensive bibliography and 11 pages of convenient, useful Temperature Conversion Tables.

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3. The Incandescent Lamp as a Source of Infrared Radiation
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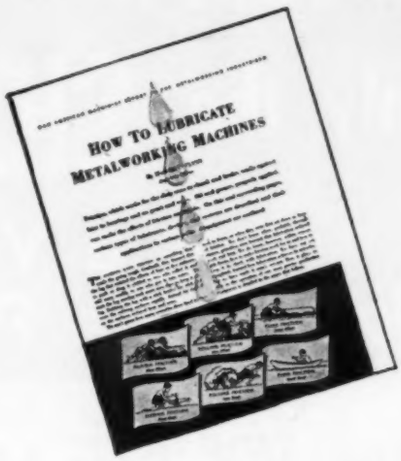

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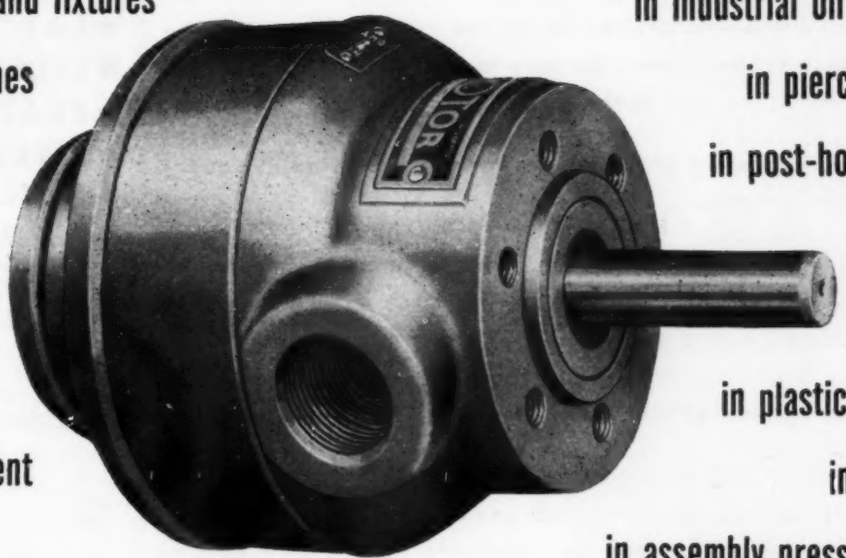

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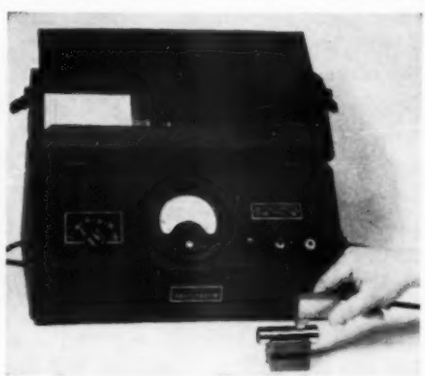

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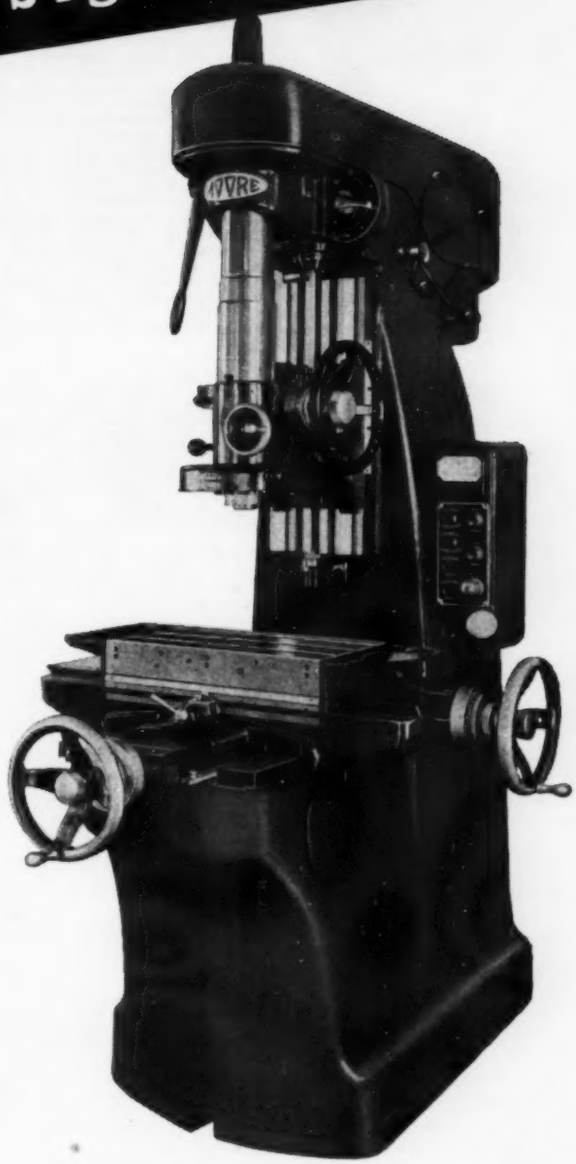

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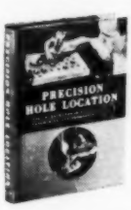
Table top to spindle end	min. 3" max. 18"	Spindle cen. to col. below ways	11½"

Send for descriptive literature.



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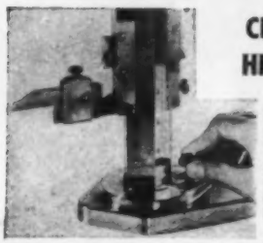

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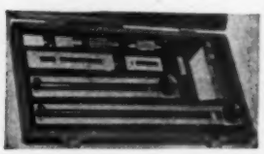

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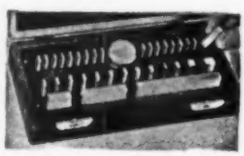

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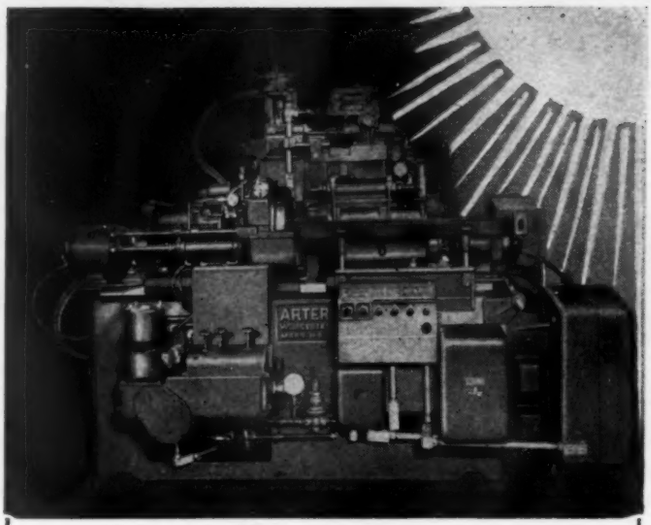

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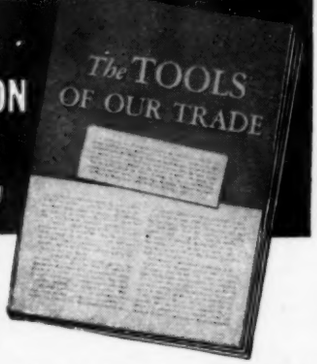

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TURRET LATHES: No. 3, No. 3A & No. 4A W & S; No. 5 J & L; All Geared Head, Univ. PRT.

PLANERS: From 48" x48"x14' Sellers to 60"x60"x30' Sellers Open-side, All Equipt. with 3 & 4 Heads, Planer Type, Reversing M.D.

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14"x6' Hendey Yoke Head
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16"x6' Lodge & Shipley Geared Head, M.D.
18"x10' American, Geared Head, Taper
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24"x10' LeBlond Quick Change Gear
26"x18' Bridgeford geared head
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24"x36' New Haven, M.D.

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2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3A Warner & Swasey Universal, motor drive
#4 Foster Universal Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe
#4 & #5 Gisholt Universal, Ram Type, Late Type with motor drive & equipment.

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Pratt & Whitney 14" x 36" Vert. Surface Grinder, motor drive
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P & W 2½" Duplex Spline Miller, M.D.
Hanson & Whitney 10"x24" Thread Miller
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#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)
Milwaukee #2 Dble. Overarm. Motor driven.
Cincinnati #3 Dial Type Vertical. M. Drive.

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3½" Bar Landis-Rochester Horizontal Boring Mill, Model #3

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3½' Arm, 10" Column Cincinnati-Bickford
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5' Arm, 13" Column Cincinnati-Bickford
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6' Arm, 15" Column Cincinnati-Bickford

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Fellows No. 6—36" Gear Shaper, motor dr.
24" American H.D., B.G. Crank Shaper. Motor drive 3/60/220/440
20x20x36 N.B.P. Shaper Planer
Whitcombe 24"x24"x6' Planer
1—New Haven, 12" Slotter (like new)
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Caldwell, 200 tons capacity, Hydraulic Horizontal Wheel Press
Lucas 15 ton Power Arbor Press
Bliss-Consolidated #163B S.S. Dble. Crank Press
Baxendale #4 O.B.I. Power Press, 2½" stroke
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36" Lehmann Hydratrol Geared Head Lathe

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#2 and #4 Cincinnati Plain Millers

#4H and #4K Milwaukee Plain Millers

#56 x 72" Cincinnati Plain Hydromatic Miller

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#2K, #3H, #4H Milwaukee Vertical Millers

#9J Gorton Vertical Miller

500 ton HPM Hydraulic Fastraverse Press

2⅝" Acme-Gridley Model RB Six Spindle Automatic Screw Machine

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#4A Warner & Swasey Universal Geared Head Turret Lathe

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16"x33" Fay with hydraulically operated tailstock. New 1942.

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4¾" bar, No. 300 Giddings & Lewis floor type Vertical travel 62", horizontal travel 132", feed of bar 40". Has outer support and bed plate.

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No. HP50 Lapointe hydraulic with extension broach support 25 ton capacity, 72" stroke. Built in 1940.

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Nos. 121, 217, 314, 315 and 422 Baker Bros.

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Nos. 2 & 3 Cincinnati with Filmatic bearings, hydraulic profile truing. Built from 1940 to 1943.

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6"x18" No. 10 Brown & Sharpe electric-hydraulic. Three have oscillating attachment.
New in 1941 and 1942.

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Nos. 3, 4 & 1L Gisholt. Built from 1942 to 1944.

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36" Bullard, spiral geared, built 1942. Also 24", 36" & 42" New Era type.

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No. 3 High Speed & No. 4 Medium Speed Cincinnati dial type horizontal. New in 1942.

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Nos. 2M, 2, 3, 4, & 4 High Power Cincinnati Nos. 2H, 3H & 4H Kearney & Trecker. Built 1942 to 1944.

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96"x48"x12' Liberty with 2 rail and 1 side head. Has power rapid traverse, forced feed lubrication and variable voltage drive with MG set.

PRESS
1000 Ton No. 666 Toledo knuckle joint coining with 4½" stroke and Farval lubrication.

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16", 24" & 28" Gould & Eberhardt High Duty.

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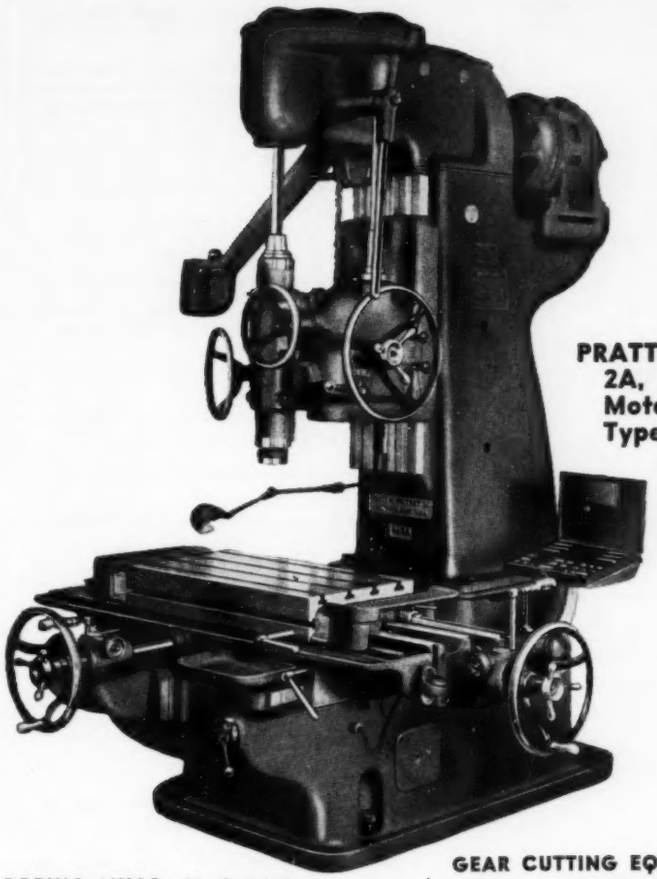

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DEFIANCE 25A— 3¾" bar—Latest Type
DETRICK & HARVEY 4", 5" bar, Floor Type
EXCELLO—Style 2112A—Jr., Latest Type
LANDIS #35, 3½" bar, Floor Type
NILES BEMENT POND 4½" Bar, Motor Drive
NILES BEMENT POND 5", 6", 7" bar, floor
OHIO 5T600—5" bar, Latest Type

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
BULLARD 16", 6 Spindle Type D—Mult-au-matic, Latest
BULLARD 36"—Vert.—Turret—New Era Type—M.D.
COLBURN 72"—2 swivel heads—A.C., M.D.
NILES 62", 73", 100"—2 swivel heads, P.R.T., M.D.
KING 36" Vertical Turret, M.D., Latest Type

BROACHES

LA POINTE #3L—15 ton, 52" stroke, Latest
LA POINTE #4L—35 ton, 68" stroke, Latest
LA POINTE—Vertical Surface, 25 ton, 66" stroke, Latest
LA Pointe—Vertical Surface—10 ton—54" stroke—Latest

DRILLS—Radial

AMERICAN 3'11" Hole Wizard—Latest Type
CARLTON 6'15", Ball Bearing—M.D.
CARLTON 8'19" Ball Bearing—Latest
WESTERN 5'18"; 6'20"—Latest Type

GEAR CUTTING EQUIPMENT

BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS 64, #615A, 645A3, #7, 72, 75A, 77 High Speed Gear Shapers, latest type
GOULD & EBERHARDT #36H, with diff. M.D.
NEWARK #5—72" Hobber—Motor Drive
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUHART & SCHUTTE #1, #2 with Diff.—Motor Drive

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #5—3"x12"—LATEST TYPE
BROWN & SHARPE #1, 2, 3, 4, Uni. Latest
LANDIS 4"x18"—Type H—LATEST TYPE
LANDIS 6x18 Type "C", Hyd., Latest Type
LANDIS 30x220" Centers, Plain, Motor Drive
NORTON 16x72" Plain Type "C" latest tylpe
NORTON 16x72" Univ., Hyd., Type C, latest

GRINDERS—Misc.

CINCINNATI #2, 4 Centerless, Latest
BARBER-COLMAN #3 Hob Sharpener, Latest
HEALD—75A, 72A-3, 72A-5, 81—Internal, Latest

GRINDERS—Surface

ARTER 30" Rotary Surface—Hyd. latest type
BLANCHARD No. 16A—Dial Type—M.D.
BLANCHARD #27-18 M.D., Latest Type
GALLMEYER & LIVINGSTON #35, 8x24" Hyd.
GALLMEYER & LIVINGSTON #55, 10x36" Hyd.
MATTISON 14x16x60 Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type
THOMPSON 16x30x48 Hyd., Latest Type
THOMPSON 8x12x24 Hyd., latest type

LATHES—Engine and Mfg.

BETTS BRIDGEFORD 60"x24' bed (raised to 84")
BRIDGEFORD 36"x28', 36"x32' bed—M.D.
LEBLOND 13"x4', 17"x5', 17"x14' bed, Rapid Production, Timken Bearing, latest type
LODGE & SHIPLEY 16/20"x30" centers, Timken Bearing, latest type
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers Timken Bearing, latest type
MONARCH 36"x108" centers—Timken—LATEST TYPE
MONARCH 12"x30" centers—Timken—LATEST TYPE
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NILES 48x23', 35' Centers, Heavy Duty, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 60"x10', 35', 40', Centers, Heavy Duty, Timken Bearing, 1 or 2 carriages, Latest Type
NILES 30x50' Boring, Timken, Latest Type
REED PRENTICE 20"x54" Centers, Timken, Latest
REED PRENTICE 24x20" bed, AC, M.D.
WARD HAGGAS & SMITH 18/36"x10' bed, Gap.

LATHES—Turret

CINCINNATI ACME No. 1, No. 5W, Timken, latest
GISHOLT #3, 5 Univ., Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3D—Simplimatic—Timken—LATEST
JONES & LAMSON #3, 7C, 8A, Univ., Timken
LIBBY No. 1H-5 Timken Bearing—latest—5½" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
WARNER & SWASEY 4, 5, Universal, Timken Bearing, Latest Type
WARNER & SWASEY #1A, 4A Univ., Timken Bearing, latest type
WARNER & SWASEY #3A, Univ., 6" hole, Bar or Chucking, Timken Bearing, latest type

MILLING MACHINES—Mfg.

CINCINNATI 3-24 Duplex, Hydromatic, Latest Type
INGERSOLL 32x24x16' Planer Type, 2 heads, AC
INGERSOLL 48x42x16' Planer Type, 4 heads, AC

MILLING MACHINES—Plain

BROWN & SHARPE #12, Timken, Latest
CINCINNATI—1-12, 2-24, Timken, Latest
CINCINNATI #4, 48, 5 Timken Bearing, M.D.
CINCINNATI #2, #3, Dial Type, Timken, Latest
CINCINNATI 4-36 Hydromatic, Timken, LATEST
KEARNEY & TRECKER, 1218, Simplex, Timken, Latest
KEARNEY & TRECKER 3K, Timken, latest
KEMPSMITH, #4 Maximill, Timken Bearing, latest

MILLING MACHINES—Universal

AMES Bench, Timken, Latest
HARDINGE, Model UM, Timken, Latest
VAN NORMAN—12, Timken, Latest

MILLING MACHINES—Vertical

CINCINNATI—2, 3, 4, Dial Type, Timken, Latest
CINCINNATI No. 3, No. 4 High-Powered, M.D.
KEARNEY & TRECKER 2K, 3K, Timken
REED PRENTICE #3VG, with or without Detroit Hyd. Univ. Duplicator, Timhken Bearing, latest type

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84"x84"x18'—4 heads, DC, Motor Drive
LIBERTY 24"x24"x8'—2 heads, VARI-VOLTAGE—AC, Latest Type
ROCKFORD 24"x24"x66"—3 heads, Hyd., Latest
NILES BEMENT POND 48x48x16', 2 heads, AC
OHIO 42x42x20'—2 heads, AC, M.D.

SHAPERS

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LAMAIRE 18' Vert. Hydraulic—latest type
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Norton 6"x10"x36" Surface
Norton 15"x15"x72" Surface
Hill-Acme 18"x18"x96" Surface
Norton 6x32, 10x24, 10x50 Plain
B. & S. Nos. 5, 10, 11, Plain; #13
Bryant Nos. 3B, 5, 6, 12 Internal
Heald No. 70-A, Internal
Cincinnati No. 1½ Tool & Cutter
Norton No. 2 Tool & Cutter
Cincinnati No. 2 & No. 3 Centerless
Cincinnati No. 3 Centerless Lapper
Fitchburg 36" Spline Grinder
Blanchard No. 16—30"
Heald No. 25-A Rotary Surface
P. & W. 14" Vert. B.B.; also 22".

LATHES
Hendey 14"x6' Y.H. Fact. M.D.
American 16"x6'—G.H.
Lodge & Shinley 20"x8' G.H.
Fitchburg 60"x22' LCG

MILLERS
Milw. #2B Univ.
Cin. #2 Univ.
K & T #2HL & #4H Plain
Milw. No. 2B & 3B Double Overarm
B. & S. No. OY Production, #2 Plain
Cin. No. 2MH Plain; Nos. 3, 4 Vert.
B & S #2 Std. Vert.
Becker Model C. Vertical
B. & S. No. 3B & 5B Plain
Kempsmith #2G Plain
Van Norman #2, #10, #20
Rice-Barton 4" Spline
P. & W. 8", 10", & 12" Automatic
Cincinnati 18" & 24" Production
Sundstrand No. 00 and No. 2 Electromil
P. & W. 6x14 & 6x72 Thread
Lees-Bradner 6"x36" Thread
Van Norman Duplex Nos. 0-20-20
Cincinnati #5 M.D. Plain
K&T #2K, 3K Vertical

PRESSES
Toledo #57 Bliss #3½ A
1000 ton Toledo Knuckle Joint
WF 3000 ton Hydraulic
WF 157 Ton Vertical Hydraulic

SCREW MACHINES
B. & S. No. 00, 0, 2 Automatic
B. & S. No. 1 & 2 Hand Screw
Cleveland 1⅜" Model AA
W. & S. Nos. 1, 2, 2A, 3A Universal
Foster No. 7 and No. 1B
Cone 1¼" 4 Spindle
Cleveland 3¾" Model A, Latest Type
Cone 3½"—4 Spindle
Cleveland 6¾" Model A
Cleveland 7¾" & 8" Model A
Gridley ⅞", 1¼, 1¾", & 2⅝", Model G; 3¼" & 4¼"
Cleveland 2½", Model K

MISCELLANEOUS
Borematic—Heald No. 47-A
Boring Mill—Gisholt 30"
Boring Mill—Lucas #42
Boring Mill—Bullard 36" & 42" New Era
Boring Mill—Bullard 100" 2 Head
Duplicator—Gorton #9J
Jig Borer—Pratt Whitney #1½B

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12'-3/16" 10'½" Power Press brakes.

Brand new 4½ ton OBI Presses, reduced to $165.00 ea. New 15 ton reduced to $363.00 ea.

1—#87 Bliss Press, 175 ton rated cap. 32" stroke, late model.

BUTT & SPOT WELDERS, IMMEDIATE DELIVERY 5-300 KVA, BRAND NEW.

PAULS MACHINERY COMPANY

MONA MEMBER

6103 Vermont Avenue
Detroit 8, Michigan
TYLER 76300

UNUSUAL VALUES

Milling Machines—#1, Universal, #1 American (new) plain, #1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe #3—26", Gould & Eberhardt 42".

Grinders—Cylinder, B & S #11, Planer type 16"x36", Surface 13"x62", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—16"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 10" and 12" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes— J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 36", 40".

SPECIAL—New totally enclosed, dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt #25—24" Hi Duty. 3" capacity in steel, motor attached.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

ALWAYS A SOURCE OF SUPPLY

For Machine Tools, Stamping Presses, Structural Machinery, Forging Equipment, Hydraulic Equipment, Air Compressors, Production Equipment.

OUR SERVICES ARE ALWAYS AT YOUR DISPOSAL

EMERMAN MACHINERY CORP.
875 W. 120th STREET
CHICAGO 43, ILLINOIS

THE LARGEST MACHINE TOOL PLANT IN THE U.S.A.

Eastern OFFERS FROM STOCK

DEVOTED EXCLUSIVELY TO REBUILT MACHINERY

ALL MACHINES REBUILT TO FACTORY STANDARDS OF ACCURACY

RADIAL DRILLS

3'-9" Column American Hole Wizard, m.d., latest
3' American Sensitive, belt
4'-9" column Cincinnati-Bickford Super-Service, m.d., latest
4'-11" American Triple Purpose, m.d.
4' Niles-Bement-Pond Semi-Universal, m.d.
5'-13" American Triple Geared, gear box
5' Cincinnati-Bickford Plate Hole Driller, m.d.
5' Prentice Plain, motorized
6' American Triple Purpose, m.d. on base
6'-15" Carlton, gear box
6' Cincinnati-Bickford, m.d. on base
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d.
8'-16" American Triple Purpose, m.d. on arm
10'-22" American Triple Purpose, m.d. on arm

UPRIGHT DRILLS

21" Cincinnati-Bickford, m.d.
30" Rich, m.d.
32" Aurora, belt
40" Aurora, belted m.d.
H3 Barnes Hydram, m.d.
D4 Colburn, m.d.
D8 Colburn, s.p.d.
No. 25 Foote-Burt, s.p.d.
No. 36HO Baker H.D., m.d.
No. 262 Barnes All Geared, m.d., latest (3)

GEAR SHAPERS

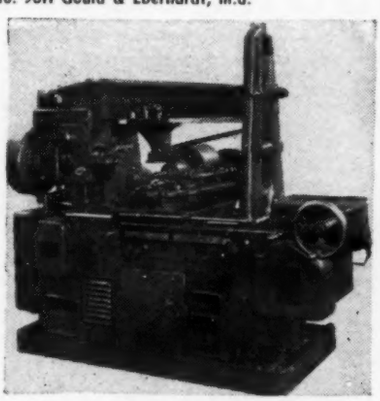
No. 6, 61 Fellows, belt
No. 7, 7A, 71A Fellows, m.d.
No. 18 Fellows Finishing Machine, m.d.
No. 61A Fellows, m.d., latest
No. 64-S Fellows, m.d.
No. 615A Fellows, m.d., latest
No. 645A3 Fellows, m.d., latest

GEAR GRINDERS

No. 13LS Fellows Lapper, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical Gear Grinders, m.d.
No. 2HS Lees-Bradner Spur & Helical Gear Grinders, m.d.

GEAR HOBBERS

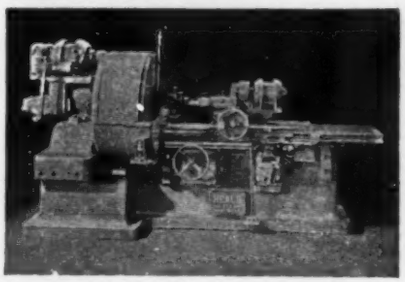
Type A Barber-Colman, m.d., latest (8)
Type T Barber-Colman, m.d., latest
No. 12 Barber-Colman Double Overarm, long bed type
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d.
No. 36H Gould & Eberhardt, m.d.
48" Cleveland, m.d.
No. 96H Gould & Eberhardt, m.d.



Type A Barber-Colman Gear Hobber

GEAR CUTTERS

3 spindle Gould & Eberhardt No. 36BM Vertical Rougher
Gleason Spur Gear Testing Machine, m.d.
No. 1 Brown & Sharpe Spur Gear Tester
No. 3—26" Brown & Sharpe Spur Gear Cutter, m.d.
No. 6—60" Brown & Sharpe, m.d.
3" Gleason Straight Bevel, m.d.
8" Gleason Mfg. Typpe Straight Bevel, m.d.
11' Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
Cross Gear Tooth Rounder, m.d.



#172 Heald Gap Grinder

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 3/8" valve stems

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., brand new
No. 55 Heald, m.d.
No. 73 Heald Airplane Cylinder, m.d., new

PLAIN CYLINDRICAL GRINDERS

No. 5 Brown & Sharpe 3x18", m.d., latest
6x18" Landis, m.d.
6x18" Cincinnati Plain Hydraulic, m.d.
6x30" Cincinnati Hydraulic, m.d., latest
6x32" Fitchburg Type A, m.d., latest
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
No. 10 and 11 Brown & Sharpe, m.d.
10x24 and 10x72" Landis Self-Contained, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Landis Typpe C Hydraulic, m.d., latest
12x36" and 12x96" Landis Self-Contained, m.d.
14x48" and 14x72" Cincinnati Self-Contained, m.d.
14x52" Norton, motorized
20x120" Landis Self-Contained, m.d.
26"x96" Landis Self-Contained, m.d.

DISC GRINDERS

No. 4 Gardner, m.d.
No. 20 Gardner Comb. Disc Grinder and Roll Sander, m.d.
7½ H.P. United States, new, 18" discs
7½ H.P. Standard, new, 18" discs

INTERNAL GRINDERS

No. 16A—16" Bryant, m.d.
No. 16—22" Bryant Hydraulic, m.d., latest
No. 16RS Bryant, m.d., latest
No. 6, 10, 20 Bryant, belt
No. 9 Cincinnati, belt
No. 24—21" Bryant, m.d.
No. 49 Heald Single End Borematic, m.d.
No. 70 Heald, belt
No. 72A Heald Plain, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald Plain, m.d., latest
No. 72A5 Heald, long bed type, m.d., latest
No. 72A5 Heald Sizematic, m.d.
No. 73 Heald Airplane Cylinder, m.d., new, latest
No. 74 Heald, m.d., late
No. 172 Heald Gap, m.d., brand new

SURFACE GRINDERS

No. 5 Brown & Sharpe Hydraulic, m.d., latest
No. 5 Thompson Hydraulic, m.d., latest
14" Pratt & Whitney Vertical, m.d.
16" Arter A3 Rotary, m.d., new
Builders Co. Hand, 8x4" chuck
No. 10 Blanchard, m.d.
No. 11 Blanchard, m.d., latest
No. 16 Blanchard, m.d., 26" chuck
No. 18 Blanchard, m.d., 30" chuck, latest
No. 25-A—16" Heald Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
22" Pratt & Whitney Vertical Type B, m.d.
No. 22—12" Heald Rotary, m.d.
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald, belt
30"x18"x6' Springfield Planer Type, m.d.
54" Bridgeport Knife, belt
No. 5C—60"x16" Thompson, m.d.

THREAD GRINDERS

No. 33 Excello Precision, m.d., latest

AUTOMATICS

4 spindle 7/8" Cleveland Model M, bar
4 spindle 2" Cleveland Model M, bar
4 spindle 2¼" Cleveland Model K, bar
2¼" Cleveland Model A, bar
2¼" Gridley, bar, d.c. motor
2½" Cleveland Model A, bar
4¼" Cleveland Model A, bar
4½" Cleveland Model A, bar
5½" Cleveland Model A, bar
6" Cleveland Model A, bar
7¾" Cleveland Model A, m.d.
No. 4D Potter & Johnston, m.d., late
No. 5D Potter & Johnston, m.d., latest
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay, m.d., Flanders Type
20x25" Jones & Lamson, m.d., latest

BOLT THREADING MACHINE

¾" Economy Style R, Lanco Head
1¼" Landis, m.d., with Lanco Heads
3 spindle 1¼" Acme, belt

HORIZONTAL BORING MILLS

2½" Cleveland, m.d.
2½" No. 21 Lucas, m.d.
3" No. 31 Lucas, m.d.
3½" No. 32 Lucas, m.d.
4½" No. 33 Lucas, m.d.
4" Detrick & Harvey Floor Type, m.d.
4" Niles, belted m.d.
4½" Niles, belted m.d.
5½" Niles, m.d.
10" bar Sellers Floor Type, m.d.
Morton 60" stroke Boring Mill and Draw Cut Traveling Head Planer, m.d.

VERTICAL BORING MILLS

24" Bullard Spiral Drive, with side head, m.d.
24" Bullard New Era, m.d., with side head (4)
36" Bullard New Era, m.d., with side head, (4)
36" Bullard Spiral Drive, m.d., with side head, latest
42" Colburn H.D., m.d., 2 rail heads
48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
48" Colburn H.D., 1 turret, 1 swivel head
53" Niles, m.d., 2 swivel heads
72" Cincinnati, m.d., 2 swivel heads
84" Niles H.D., m.d., 2 swivel heads
100" Niles H.D., m.d., 2 swivel heads
42" Bullard New Era, with side head, m.d.

BROACHING MACHINES

Oil Gear Hydraulic type XA, m.d.
Colonial VAS-5-42, m.d., latest
No. 4 LaPointe, gear box
Cincinnati Mill Broach, 10" spindle, m.d.
No. 75 HP LaPointe Horizontal Hydraulic, 37½ tons cap., latest type

BALL BEARING DRILLS

No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2½ Allen, m.d., latest

LET US QUOTE ON YOUR REQUIREMENTS.
MORE THAN 2,000 MACHINES IN STOCK

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio MElrose 1241
CABLE ADDRESS EMCO

IN STOCK — IMMEDIATE DELIVERY

LATHES
8"x15" Sundstrand, Model C
10"x22" Sundstrand, Model AA
12"x18" Lipe Carbo, Motor Drive
14"x6' Hendey
18"x6' American Grd. Hd.
20"x10' Lodge & Shipley
22"x48" Centers Monarch (1942)
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
50"x17'cc LeBlond Geared Head

MILLING MACHINES
No. 2-B Hvy. Brown & Sharpe Pl.
No. 4 Cincinnati High Power Plain
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. Dial Type
No. 3 Cincinnati Vert. High Power
No. 3K Milwaukee Vertical (1942)
24" Cincinnati Production
No. 2—18" Cin. Auto. R. and F.
No. 4—48" Cin. Hydro. Tracer Control
No. 5—48" Cin. Hydro.
No. 45—48" Cin. Hydro. Duplex Tracer
No. 56-90 Cin. Hydro. (1942)
No. 2 Hanson-Whitney Thread
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
26"x25"x12' Ingersoll Adjustable Rail
54"x36"x10' Ingersoll Adjustable Rail
60"x48"x12' Ingersoll Adjustable Rail

DRILLS
No. 121 Baker, Motor Drive
No. 217 Baker—(1943)
28" Cinn.-Bickford
No. D-8 Colburn No. 6 M. T.
No. 2 LMS—26"—1 Spdl. L-G (1944)
No. 2 LMS—20"—2 Spdl. L-G (1944)
No. 2 LMS—26"—2 Spdl. L-G (1945)
No. 2 LMS—20"—3 Spdl. L-G (1943)
No. 2 LMS—14"—4 Spdl. L-G
No. 4 BM—24"—4 Spdl. Fosdick
No. 2 LMS—26"—4 Spdl. L-G
No. 2LMS—26"—6 Spdl. L-G
No. 2—8 Spdl. Leland-Gifford
3'-10" Col. American Triple Purp.
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

VERT. BOR. MILLS
34" King
42" Bullard New Era
72" Cincinnati
72" Niles Extra Heavy

HOR. BOR. MILLS
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

GEAR MACHINES
No. 7 Fellows Gear Shaper
11" Gleason Bevel Gear Cutter

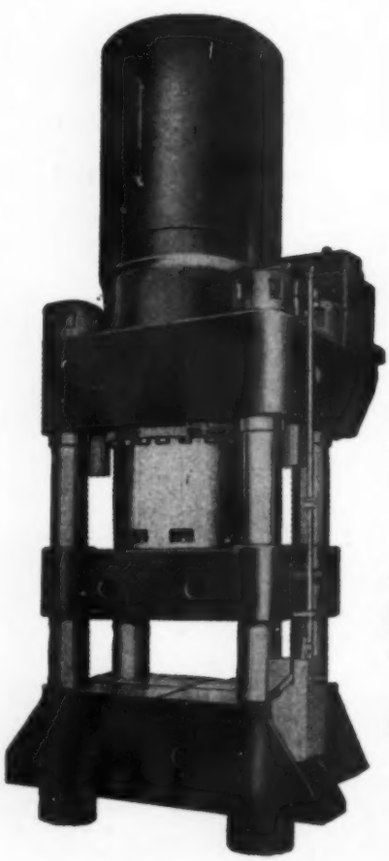
PLANERS
36"x36"x12' Cincinnati, 4 Heads
42"x36"x12' Cincinnati, 3 Heads

MISCELLANEOUS
10' Pexto Shear, 10 ga. cap.
2500 Ton Lake Erie Hydraulic Press

TURRET LATHES
No. 2 B. & S. Screw Machine, Wire Feed
No. 3 Jones & Lamson (1942)
No. 3 Warner & Swasey, bar feed (1940)
No. 4 Gisholt (1942)
No. 5 Warner & Swasey bar feed (1941)
No. 5 Warner & Swasey, air chucks (1941)
2-A Warner & Swasey
18" Libby, 3½" H.S.

GRINDERS
No. 49 Excello Carbide Tool Grd.
No. 5 B. & S. Plain (3" x 18")
4"x18" Landis Plain
10"x72" Colonial Broach Grd.
10"x24" Landis Universal
12"x36" Landis Univ. Type LCH (1945)
12"x48" Cincinnati Univ.
16"x72" Norton Type C Plain
No. 22—12" Heald Rotary Surface
No. 25-A—16" Heald Rot. Surf. (1943)
No. 34 Abrasive Surface Grdr.
Norton Motor Driven Grinders, sizes 6x18 to 24x240

HILL-CLARKE MACHINERY CO.
651 WASHINGTON BLVD. CHICAGO 6, ILL.



1300 TON WATSON STILLMAN HYDRAULIC PRESS
Self Contained

Platen size 48"x42". Stroke 22". Opening 37. Ram Diameter 35". Driven by 50 H.P. Motor, *Also*

600 TON ELMES PRESS

Self contained 48x45" between rods, 36" stroke, 66" openings, 75 H.P. motor, 3 phase, 60 cycle, 220v.

1320 TON PRESS, SELF CONTAINED

600 Ton Self Contained Lake Erie Double Action Press with 175 Ton Cushion Cylinder. Distance between rods 48"x60", Stroke 30", opening 48".

Aaron Machinery Co.
Incorporated
45 CROSBY ST., N. Y. C.
Tel. CAnal 6-0421

NEW— SURPLUS

High Speed Counterbores and Sets of Drills

High Speed Counterbore Sets

13 Counterbores ¼" to 1"

17 Pilots ⅛" to ¾", 2 Holders

Complete in Wooden Box, $25.00 per set

#1-60 H.S. Drills, 60 Drills, with Stand $10.00 Set

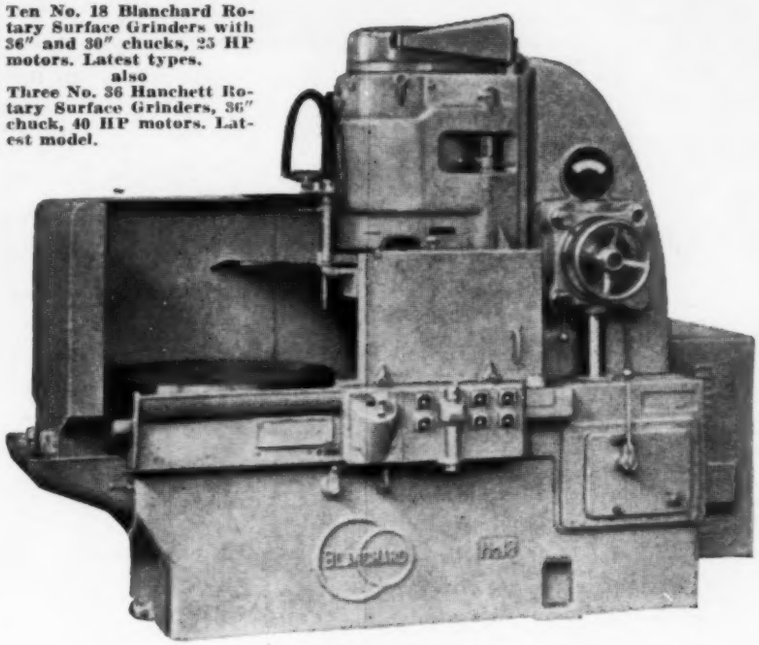
A-Z H.S. Drills, 26 Drills, with Stand $12.50 Set

1/16 to ½" H.S. Drills, 29 Drills, with Stand $13.50 Set

VICTOR MACHINERY EXCHANGE, Inc.
251 Centre St. New York 13, N. Y.
CANAL 6-5575

QUALITY *Machine Tools* NOW IN STOCK

Ten No. 18 Blanchard Rotary Surface Grinders with 36" and 30" chucks, 25 HP motors. Latest types.
also
Three No. 36 Hanchett Rotary Surface Grinders, 36" chuck, 40 HP motors. Latest model.



ENGINE LATHES,
LATEST MODELS

10" x 20" Monarch Toolmakers Model EE.

12" x 30" Pratt & Whitney Toolroom.

16" x 54" LeBlond, 12 speed, Taper attachment.

16" x 72" Lodge & Shipley, 12 speed, Taper attachment.

20" x 48" Lodge & Shipley, 24 speed.

22" x 48" Lodge & Shipley, 24 speed.

25" x 72" LeBlond, 16 speed, Taper attachment.

28" x 240" Bertram, 18 speed, Rapid traverse.

AUTOMATICS

9/16" RA-6 Acme-Gridley. New in 1943.
1⅝"—8 spindle Conomatic. New in 1942.
2⅝" RA-6 Acme-Gridley. New in 1943.
5¼" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.

BORING MILLS

No. 41 Lucas Horizontal, 3" bar. Latest model.

BROACHES

No. 28L LaPointe Hydraulic horizontal, 36" stroke, approximately 10 ton capacity.
No. CPC 8-24 LaPointe Hydraulic vertical.
No. CPC 5-36 LaPointe Hydraulic vertical.

DRILLS

No. 26HO Baker Vertical, hydraulic, 3" capacity in steel. Latest type.
4' Canedy-Otto Radial Drill. New 1946.
42" Cincinnati-Bickford.
★ **No. 3B-12 Edlund, four spindle, with back gear and semi-automatic power feed, m.d. New in 1944.**
★ **No. 2LMS Leland Gifford Single spindle drill, with hand-hydraulic spindle feed, motor driven. New in 1943.**
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse Taper, rectangular head 20" x 40".**
Barnes two spindle deep hole drill. Late model.
Taft Peirce double end horizontal drill.

GEAR CUTTERS

16H Gould & Eberhardt Universal Gear Hobber. Late type.
No. 3 and No. 12 Barber-Colman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 7125 and No. 715 Fellows Gear Shaper, m.d.
6" Gleason Straight Bevel Gear Generator.
★ **No. 3616 Cleveland Rigidhobber, spur or spiral gears to 42" diameter x 16" face, m.d. New in 1943.**

GRINDERS

Bryant No. 16-16 hydraulic chucking grinder. Latest type.
Model 75A Heald internal grinder. New in 1943.
No. 72A3 Heald Sizematic Internal Grinder.
6 x 18 Cincinnati Cylindrical. New 1943.
10 x 36 Landis Plain Hydraulic Cylindrical Grinder. New in 1943.
14" x 48" Cincinnati Plain Self contained Grinder, Filmatic-bearings.
No. 13 Brown & Sharpe Universal and Tool.
★ **No. 2 Cincinnati Centerless Grinders, with Filmatic spindle, some with through feed rest, others with infeed, motor driven. New in 1940 and 1941.**
★ **Model B Thompson Hydraulic Surface Grinder, 10" x 24" capacity. New in 1942.**
14" x 60" Mattison Surface Grinder, Hydraulic. Late model.

LATHES, ENGINE

14" x 6' Sebastian, motor in base.
16" x 6' Hendey, g.h.
18" x 8' American, g.h.
24" x 12' Monarch helical, g.h.
48" x 12' Lodge & Shipley, c.d.
IMP and LR LO-Swing Lathe, m.d., New in 1940.
15" x 30" Lipe Carbo-matic. New 1943.
17" x 50" LeBlond Production, m.d. New in 1942.

LATHES, TURRET

★ **No. 3L Gisholt, cross sliding turret, taper attachment. New in 1943.**
No. 1L Gisholt, hydraulic speed change. New in 1943.
No. 1A Warner & Swasey. New in 1943.
No. 4 Gisholt, Universal. New in 1943.
No. 5 Warner & Swasey Universal. New in 1942.
No. 3 Warner & Swasey. New in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
36" & 42" Bullard VTL, New Era.

MILLS

No. 9J Gorton, with tracer.
No. 3 Cincinnati Universal, motor in base, rectangular overarm.
No. 5 Cincinnati Plain High Power Model HO.
No. 4 K & T Milwaukee Plain. New in 1942.
No. 2MH Cincinnati Plain, m.d.
★ **28" x 60" Cincinnati Vertical Hydrotel, single spindle, with profile tracing attachment, motor driven.**
No. 4 Cincinnati Vertical, high speed dial type, latest model.
No. 2H Milwaukee Vertical, motor in base.
No. 3-36" Cincinnati Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.
Nichols Hand Mill, coolant equipment. New in 1943.

MISCELLANEOUS

No. 7 Kling Structural Punch 72" throat depth, 1¼" through 1" plate.
No. 8-6 Zeh & Hahneman Straight side geared press, bed area 14" x 14", stroke 2¼", 36 ton capacity.

PLANERS AND SHAPERS

16" Gould & Eberhardt Crank Shaper, m.d.
20" American Crank Shaper, m.d.
24" American Crank Shaper, m.d.
6" Pratt & Whitney Vertical Shaper.
No. 14 Cochrane & Bly Vertical Shaper.
42" x 42" x 20' Cincinnati Planer, D.C., Rev. M.D.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS
MACHINERY & SUPPLY CO., INC.
1961 S. Meridian St., Indianapolis 6, Indiana
EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

POWER PRESSES

Make	Tons	Stroke	Die Space	Type
(2) Federal #0	6	1¾"	15" diam. bed	OBI, Bench type; 21 Strokes per Min. Automatic Dial Feed, geared motor 3 '60/220-440
(10) Hercules	22	3"	10" x 14½"	Dial and Hopper
(10) Hercules	22	6"	10" x 14½"	Cut and Carry Feed
(10) Wat-Farrel	25	3" Ram 3" Table up	12" x 21½"	Dble or Single Action, Dial Feed
(3) Bliss #58	20	5"	12½" x 13½"	3 HP Motor 3/60/220 & 1/15 HP Motor, 120 RPM
(4) Ferracute C22 Duplex 2 Presses on 1 stand	20	5½"	13½" x 14"	Pinwheel Feeder & Hopper, 2/3 HP Motors, 3/60/220-440 plus 2¼ HP Motors
(2) Bliss #62A	30	8"	14" x 24"	Pinwheel Feeder & Hopper, 3 HP Motor, 3/60 220-440 plus 1/15 H P Motor, 90 S. P. Min.
Federal #3	30	8"	14" x 24"	Pinwheel Feeder & Hopper. 3 HP Motor, 3/60/220-440 plus 1/15 HP Motor
Torrington	50	2" & 1"	23" x 16"	Sub Arch Press, dble Action Cam
Bliss #4 Header	56	8" & 6"	1½" x 2⅝"	Horiz. Dble Header, Single Die
Toledo #54	60	3"	18" x 18"	SS with side shear
Bethlehem	88	2½"	62" x 58"	SS Dble Crank, Single Action
Bliss #5	90	5"	22" x 30"	SS Single Action
Bliss #306½	150	8"	28" x 28"	SS Single Action, b.g., Air Cushion
(2) Bliss #77½	250	12" & 14"	30" x 29"	SS Single Action, b.g.
Bliss #78½	450	10"	36" x 36"	SS Single Action, b.g
Toledo #60¼	1200	23½"	59" x 50"	SS Single Action, b.g

BENDING ROLLS—Bertsch 20' x ½" Cap.—Initial type open end—35 H P, late type

New Press Brake 10' x ⅜" all steel, 60 days dely.
New Square Shear 10' x ⅜" all steel, 90 days dely.

SHEARS—Pexto 5' x 16 G motor $475.00
Cincinnati 8' x 1" cap. (1940) negotiated
Morgan 10' x 1½" cap. 25% of cost

BRAKES—New Lynn 56" x 14 G Hydraulic Press motor $1650.00
D & K 8' x 16 G Apron, motor $575.00
D & K Hand Steel Brake 5' x 16 G $225.00

Rotary Shear—Quickwork #50A (1943) 1" x 48" cap., motor 50% of cost

KINGS COUNTY MACHINERY EXCHANGE

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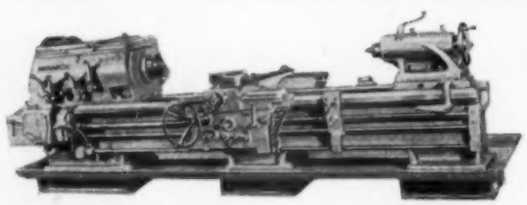

36" Monarch Lathe with Automatic Sizing Controls

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Lucas #31 Horizontal Boring Mill, 3" Bar

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MONARCH 12" x 30" Tool Room Lathe, Motor in base

BROWN & SHARPE #2B Surface Grinder with M/D Spindles

BROWN & SHARPE #2 Universal Miller, complete

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Boring Mills, 24"-36"-42"-52"-72"-96"
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Shapers, 16"-20"-24"-36".
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30" x 12' Boye Emmes G H
30" x 18' American G H
36" x 40' American G H
42" x 44' LeBlond G H

RADIAL DRILLS

3½' Cincinnati Bickford
4' Carlton, motor on arm
7' Carlton, motor on arm
8' American, motor on arm

MILLERS

No. 3 Cincinnati Universal
3-A B & S Universal
1-B Milwaukee Universal

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24" Bullard, New Era
62" N. B. P. 2 swivel heads
12' Betts 2 swivel heads
14' Betts 2 swivel heads
16-24' Niles extension type
3" spindle Universal Tri-Way
3⅛" spindle No. 32 G & L
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150" Muir gear Hobber
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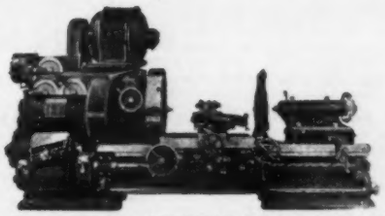
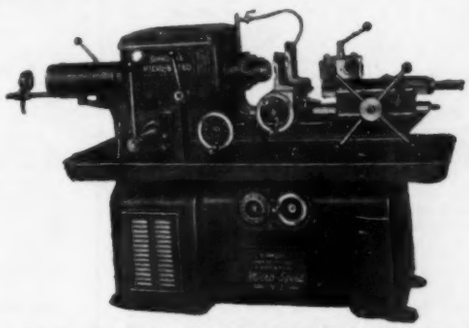


36" x 4[illegible] (between centers) AMERICAN 16-Speed Geared Head Lathe, AC or DC motor drive.



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Brown & Sharpe #4-B Heavy Plain Miller, motor driven with vertical attachment.

Brown & Sharpe #5-B Heavy Plain Miller, arranged for motor drive, motor table size 21" x 78".

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#4 Niagara Hand Angle Iron Shear, capacity 2x2x¼ $175.00

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#36 Niagara Squaring Shear, capacity 6ft. 14 ga. serial #144867, with 6 ft. side gauging arm, slightly used, about 1 year old $2100.00

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Ryerson ⅜" single end punch press $150.00

#12 Marshalltown throatless shear with circle shearing attachment for serpentine sheet steel shearing up to 12 gauge $150.00

Delta model 20-210 cut-off Saw $275.00

18" Cincinnati Miller, table size 9¼"x34", flat belt drive, table travels horizontal, adjustable head $175.00

#5 Waterbury Farrel blanking and cupping press $450.00

Coulter power mill, motor driven with 2 H.P. motor, Serial #A-12746 ..... $100.00

#162 Bliss power punch press, about 35 ton cap., 4" stroke, complete with 3 h.p. motor and magnetic starter, practically new $1050.00

#3 Waterbury Farrel punch press, capacity 20 ton, stroke 2½", ram adjustment, 60 strokes per minute, shut height 6½" bed size F to B 10¼", R to L 14¼" $475.00

Coulter & McKenzie single crank punch press, floor space 42"x40" flywheel 24"x3", 4" stroke $250.00

Van Norman horizontal milling machine, two direct drive milling heads, designed for milling special circular piece $642.00

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P & W #2A Jig Borer, 36x44
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Gorton No. 3Z engraving machines
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Doall Surface Grinder 8x24 Selectron
Marvel 6A Hacksaw, M.D.. Auto. Feed
Injection Moulders, Hydraulic Presses

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#0 Giddings & Lewis arr. M.D.
2½" Cleveland arr. M.D.
2½", 4" Binsee
Niles-Bement-Pond 4" duplex
Universal 3"
66" Niles; 54" Colburn M.D. 2 hds.

TURRET LATHES

Bullard New Era 24", 42", Vert. M.D.
W. & S. Nos. 3, 4, 5 Grd. Hd., Preselector
Gisholt No. 1L, 2L Univ. M.D.
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36", #3, Dial Type
Acme #2 M.D.

GRINDERS

No. 34 Abrasive Vert. Surf. #3B, 8x24"
#25 Gallmeyer & Livingston Hyd. Surface
#25A Heald, M.D. like new Rotary Surf.
No. 2 Cincinnati Centerless M.D.
B. & S. No 2, 2B Surface, M.D.
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Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald No. 72A3 Gagematic
Norton 50"x28', M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D.
No. 55, 60, 65 Heald int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10 11 Cyl.; 1, 3 Univ.
Norton 6x18" Hyd. Surface, M.D.

LATHES

Monarch Hendey 12x30, 10x20 G.H. Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey, Taper, Collets
9" LeBlond, P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
20"x30' Boye & Emmes Grd. Hd.

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Cleveland Model A ⅞", 1¼", 2"; B 1", 2"
⅞" Cone 4 spindle, Gridley
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Power Shears—52", 72" & 96"

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6x6" Racine Hacksaw; #8 Marvel
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6' Cincinnati-Bickford
4' Fosdick 13" col., 8' Carlton, 19" col. M.D.
4', 5', 6' American Triple Purpose

MILLING MACHINES

Cincinnati No. 1/18 Mfg. late.
Cleveland Vert. No. 1 M.D.; #1 Univ.
#12 #22L Van Norman
#2B K & T Univ.; No. 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No 1, 3, Vert.
B & S #12 Elec. Prod. late type

MISCELLANEOUS

Cincinnati 20" shaper, like new.
Oliver No. 510 Drill Pointer
Buffalo #0 Angle Roll M.D.
#20 Bliss OBI, #58-OB Gap Presses
Gorton 3Z, 1S, Pantographs
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
#272 Niagara, Pexto 6' Power Shears
Burke & Nichols Millers, Pl. & Univ.
Delta Single & Multiple Drills
Niagara 8' Foot Shear
Natco G6 Hyd. Mult. Drill, 24 spindle
Deckel G1, G2 Engraving machines
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36" BULLARD Vert., M.D.
#25-C DEFIANCE Table Type, M.D.
#25-RT GIDDINGS & LEWIS Table Type, M.D.
#340T GIDDINGS & LEWIS Table Type, M.D.
#360-F GIDDINGS & LEWIS, Floor Type, M.D.
#560-F GIDDINGS & LEWIS, Floor Type, M.D.

GRINDERS

14"x16"x60" THOMPSON, Type "C" Surf.
#2 B & S Surface, M.D.
#2B REID Surface, M.D.
#10 B & S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
9" P & W Hyd. Gear Grinder, M.D.
#5 B & S Plain Grinder, M.D.
#11 BLANCHARD Rotary, 16"x20" chucks.
#18 BLANCHARD Rotary, 30"x36" chucks.

LATHES

AMES Precision Bench Lathe, 1" Collet Cap., M.D.
14"x54" LODGE & SHIPLEY G.H. Lathe, M.D.
12" & 14" x 30' LODGE & SHIPLEY G.H. Lathe, M.D.
12"x30" MONARCH Mod. "C" Lathe, M.D.
16"x6' SEBASTIAN Lathe, M.D.
15"x8' ROBBINS G.H. Lathe, M.D.
24"x108" centers MONARCH Mod. "N", M.D.
32"x324" cen. LEBLOND LATHE, T.A., M.D.
50"x17" centers LEBLOND "BIG SWING" Lathe, M.D.

MILLING MACHINES

#5/60 CINCINNATI, Duplex Hydromatic Milling Machine, tracer control mechanism for automatic rise & fall of spindle carriers, M.D., machine used six months.
#12 VAN NORMAN Ram Type Univ.
#1G & 2G KEMPSMITH All Geared Univ., M.D.
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type, Plain, M.D.
#3HS CINCINNATI Dial Type, Vert., M.D.
#4 CINCINNATI "HI-POWER" Vert., M.D.
#5H KEARNEY & TRECKER Plain, M.D.
#1H-12 KEARNEY & TRECKER MFG., M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#12-M MOREY 2-spdle PROFILER, M.D.

TURRET LATHES

#0G B & S Auto., M.D.
#0 B & S Wire Feed Screw Machines, M.D.
#2G Morey Ram Type, M.D.
#2 B & O Geared Elec., M.D.
#3 W & S Ram Type Univ., M.D.
#3 J & L Ram Type Univ., M.D.
#5 J & L Ram Type Univ., M.D.
#1A W & S Saddle Type Univ., M.D.
#2A W & S Saddle Type Univ., M.D.

MISCELLANEOUS

6'x48" THOMPSON Broach Grinder.
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1½" Dble. Head LANDIS Thdg..Mach..M.D.
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20"x16' L&S Selec. Grd. Hd., AC MD, taper
24"x14' L&S Turner Uni-Drive
36"x20' L&S Selec. Grd. Hd., AC MD

MILLERS

INDEX Vert., PF to table, AC MD
#2 MILWAUKEE Univ. SPD, DOA, Timken, PRT Div. Hds.
#4B MILWAUKEE Plain, arr. MD, DOA, PRT
#2A B&S Univ., AC MD, PRT
#3 B&S Plain, AC MIB, PRT, DOA
#4B B&S Plain, AC MD

SHAPERS

24" G&E Invincible, AC MD
32" G&E Invincible, AC MD

GRINDERS

#2-3 REID Surface, AC MD
#72A2 HEALD "Sizematic" Internal, AC MD
#2 BROWN & SHARPE Univ., arr. AC MD
#22 HEALD Rotary, AC MD

MISCELLANEOUS

24"x36" BULLARD "New Era" VTL's, AC MD
#12 BARBER-COLMAN Gear Hobbers
3' CINCINNATI-BICKFORD Radial, gearbox, AC MD
6' CINCINNATI-BICKFORD Radial Drill, Mtr. on arm
7' DRESES Radial Drill, gearbox, AC MD
#00 BAKER Keyseater
#2 MITTS & MERRILL Keyseater
14" BETTS Crank Slotter, AC MD
Michigan Relieving Machine
#2 M&M Keyseater
12'x10 ga. OHL Press Brake
72" G&E Gear Cutter
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5¼" Gridley Sgl. Spdl. Automatic
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CA-4 Ferracute Horn Press, 35 Ton Cap.
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No. 16 Bliss Horn Press, Vee Belt, M.D.
Nylint Dbl. End Gage Grinder, M.D.
No. 1 Wilmarth & Morman Surface Grinder, M.D.
No. 33 Abrasive Surface Grinder, M.D., Chuck & Rectifier
No. 1-B Milwaukee Plain Mill, Sgl. Pulley, M.D.
No. 2 Jackson Vertical Mill, M.D.
12" x 10 Gage Ohl Press Brake

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LATE TYPE TOOLS

#2MH Cinci. Univ. Miller 1944
#3SP Van Norman Miller 1942
Nos. 2, 3, 4, Cinci. Vert. Miller '42, '45
#2, 3, 4 & 5 W. & S. Univ. &
#3 J. & L. Univ. Turret Lathes
#712 Fellows Gear Generator, 1942
36H & 48H G.&E. Gear Hobbers
30"x15' centers Amer. Super Pro. Lathe
18" raised to 24½" x 192" centers, BB Model Monarch, Carr. P R T., '42

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SPECIAL OFFERING LARGE BORING MILL

(1) Giddings & Lewis Floor Type Boring Mill, Model #300, 4½" Spindle, 13'x10' Floor Plate, Purchased New in 1933.

Price $6500.00

Immediate Shipment From Stock

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MODERN—LATE TYPE TOOLS

DRILLS

4'9" CINCINNATI BICKFORD Super-Service RADIAL—elec. column clamp—2-speed motor—220-440/3/60 — tapping attachment — LATEST TYPE AND DESIGN—approx. 1943 Mfg.
3'11" CANEDY-OTTO RADIAL—LATE TYPE—motor on arm—220/3/60/1800—1942 Mfg.
3'9" AVEY Sensitive RADIAL—Belt Drive
#3MS LELAND-GIFFORD—3 spdle—12"—BG—Power feeds on all spdles—LATE TYPE 4-speed motors—440/3/60—#3 MT
21" CANEDY-OTTO—BG—Upright—#4 MT—220-440/3/60—PF to spdle—V-belt drive—NEW

GRINDERS

#2 CINCINNATI Centerless "Filmatic"—220-440/3/60—thru feed work rest-infeed work rest & infeed attach.—LATEST TYPE—Approx. 1943 Mfg.
#2 CINCINNATI Tool & Cumtter—220-440/3/60—Universal—large assort. of accessories—LATEST TYPE—Approx. 1941 Mfg.
#13 BROWN & SHARPE—Universal & Tool—220-440/3/60—LATE TYPE—with cabinet and extra attachments—1942 Mfg.
#25 HEALD Rotary Surface—with chuck
6x18 MONARCH Surface—hand feed — Excello mtzd. spdle—550/3/60—with chuck
#2 BROWN & SHARPE Surface — 6x18 — hand feed—MD—220-440/3/60—LATEST TYPE AND DESIGN—1943 Mfg.

LATHES AND TURRETS

16/20x58" LODGE & SHIPLEY—24 speeds—Selective Head—Taper Attachment 220-440/3/60—with extra equipment—LATEST TYPE AND DESIGN—1942 Mfg.
16"x6' SEBASTIAN—Type R-8 speed—Geared Head—Timkenized Spdle—220/3/60 NEW
20"x54" REED-PRENTICE—16 speed — Geared Head—taper attach.—220-440/3/60 with additional equipment—LATEST TYPE AND DESIGN—1942 Mfg.
14"x30" REED-PRENTICE—16 speed — Geared Head—taper attach.—21 collets—chucks—220/3/60—LATEST TYPE AND DESIGN—Approx. 1942 Mfg.
14"x30" LODGE & SHIPLEY—12 speed—motor in base—TA—chuck—stops—220/440 4-way tool post and other equipment—Approx. 1941 Mfg.
14"x6' HENDEY — QCG — back geared — motor
#3 JONES & LAMSON—Universal Turret—220/3 plates — centers
#3 JONES & LAMSON—Universal Turret—220/3/60 — with extras and bar feed LATEST TYPE AND DESIGN—1943 Mfg.
#2 WARNER & SWASEY—Turret—Belt Drive—PF to turret—4 speed drive

MILLING MACHINES

#3K K&T "MILWAUKEE" Plain Horizontal—power rapid traverse — 220-440/3/60 motor in base — LATEST TYPE AND DESIGN — 1943 Mfg.
#2K K&T "MILWAUKEE" Plain Horizontal—power rapid traverse—220/3/60 motor in base—LATEST TYPE AND DESIGN—1943—Mfg.
#1½B K&T "MILWAUKEE" Universal — all geared—SPD—double overarm—dividing heads—PF all directions
#3 CINCINNATI—Plain Horizontal—power rapid traverse—dial type—220/3/60 LATEST TYPE AND DESIGN—1942 Mfg.
#2M CINCINNATI Plain Horizontal—motor in base — 220/3/60 — vertical attach. FIRST CLASS CONDITION
#2B BROWN & SHARPE Plain Horizontal—double overarm—dual controls 220/3/60—motor in base
#22L VAN NORMAN Universal—power rapid traverse—dividing heads—Universal subhead—pump—other equipment—LATEST TYPE AND DESIGN—1942 Mfg.
#5H K & T "MILWAUKEE" Vertical—power rapid traverse—220/3/60—PF to head LATEST TYPE AND DESIGN—1942 Mfg.
#2K K&T "MILWAUKEE" Vertical—power rapid traverse—220/3/60—PF to head LATEST TYPE AND DESIGN—1942 Mfg.

PRESSES

#DP53 FERRACUTE—40 ton—SS—motor driven 220/3/60—Plain—with side shear 1940 Mfg.
#3K PERKINS—Screw—NEW

SAWS

#4C COCHRAN-BLY—Cold—inserted tooth blade—motor drive—220/3/60
6x6 L-W "TOLEDO" Power Hack—motor drive—cabinet model—NEW
8x16 KALAMAZOO Metal Cutting Band—110/1/60—motor & equip. with contour sawing attachment—NEW
8x16 KALAMAZOO Metal Cutting Band—110/1/60—motor & equip.—NEW

SCREW MACHINES

#0G BROWN & SHARPE—fully automatic—vertical slide attach.—serial number over 7000
#00G BROWN & SHARPE—fully automatic—serial number over 11,000—motor driven—slotting attach.—swing stop and equip.—LATE TYPE
#00G BROWN & SHARPE—fully automatic—serial number over 14,000—motor driven—slotting attach.—swing stop and equip.—LATE TYPE
#9 BROWN & SHARPE—fully automatic—Belt Drive
#R4 NATIONAL ACME—4 spdle—fully automatic 3½" cap.—220-440/3/60 complete assortment of equipment—LATE TYPE

SHAPERS

16" GEMCO "LUBRIGARD" 220/3/60 — power rapid traverse—front support—heavy duty—plain—NEW
16" GEMCO "LUBRIGARD" heavy duty — UNIVERSAL—power rapid traverse—front table support—220/3/60—LATEST TYPE AND DESIGN—1945 Mfg.—equivalent to new
24" GOULD & EBERHARDT—crank—motor driven with 4-speed drive—very clean
28" AMERICAN—Back Geared—all geared—power feed to head—SPD

SHEARS

36" PEXTO—Power Squaring—motor drive—16 gauge
42" WHITNEY—Power Squaring—16 gauge—motor 220/3/60—NEW

MISCELLANEOUS

DIE FILER—Thiel #3—motor—220/3/60
PLANER—Whitcomb—24"x24"x6'—Arr. motor drive—less elec. equip.—1 rail hd.
PLANER—WOODWARD & POWELL—60"x60"x12'—2 rail hds—1 side hd.—box bed
HAMMER—BLISS—300#—board drop

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IMMEDIATE DELIVERY FROM STOCK

COLUMBIA POWER PRESS BRAKE (NEW) all steel 10'x3/16", 8'x¼".
COLUMBIA POWER SQ. GAP SHEARS—(NEW) all steel 10'x3/16".
BLISS #306½ 150 ton 7" stroke Single Geared Air Friction Clutch, Air Counter-balance of slide.
BLISS #304, 55 tons 9" stroke, bed 17" x 17", motorized.
CALLAHAN #181½ Rotary Body former (New)
TOLEDO #3½ O.B.I. Motorized.
GRAUTNESS dble. end Flanger MD, Hand fed 14" dia. up.
GRAUTNESS dble. end MD adjustable drum corrugator.
BUCKEYE HYDRAULIC PRESS: 4 col. up moving ram stroke 36", daylight 72", Platen 22"x36".
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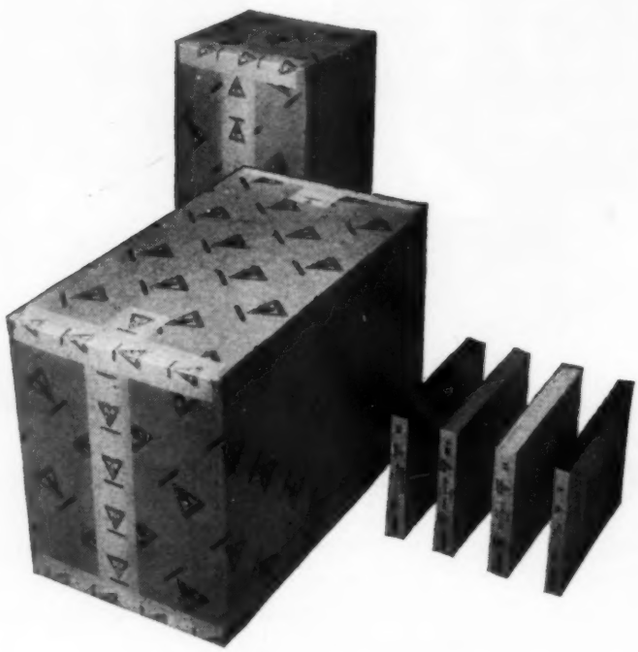
to its Distributors & Consumers



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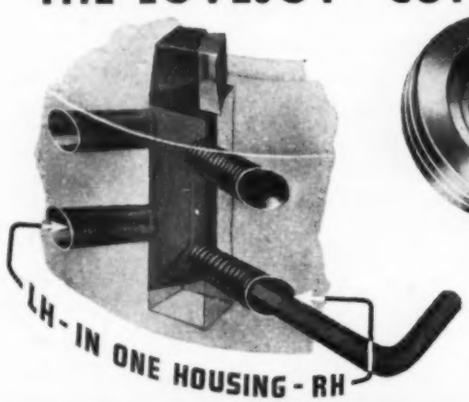

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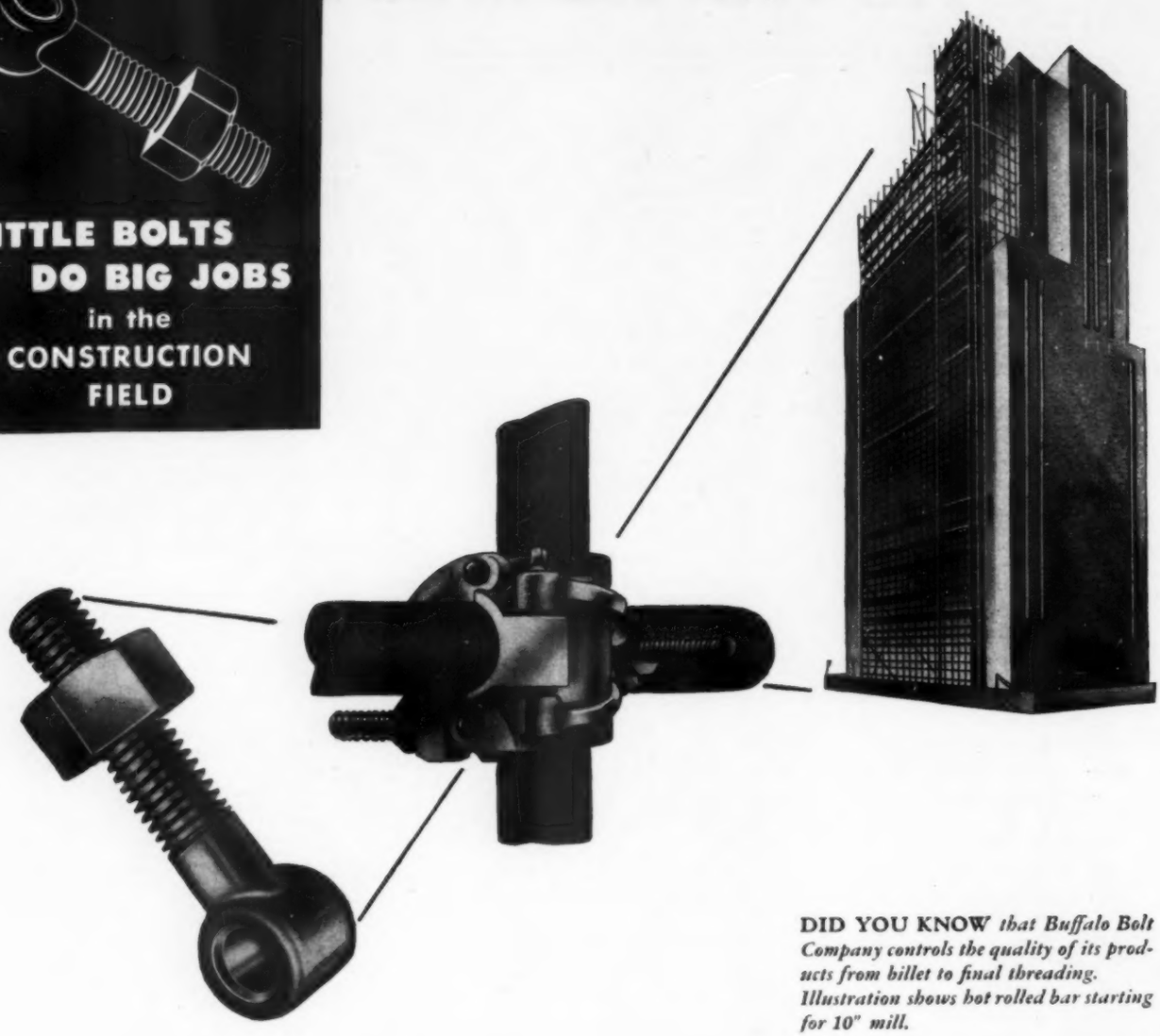

DID YOU KNOW *that Buffalo Bolt Company controls the quality of its products from billet to final threading. Illustration shows hot rolled bar starting for 10" mill.*

● Modern scaffolding makes it possible to erect or renovate large structures with unbelievable speed, efficiency and safety . . . an accomplishment in which small fasteners play a highly important part. For it is upon the strength and reliability of fasteners such as the special Circle Ⓑ Bolt illustrated that the ultimate utility of the scaffolding depends.

Circle Ⓑ Fasteners have a long-standing reputation throughout industry for dependability . . . for uniform size and strength. That's why you will find Circle Ⓑ Bolts and Nuts . . . standard and special . . . used so extensively on such a wide variety of well-known products.

Ⓑ **BUFFALO BOLT COMPANY**

NORTH TONAWANDA, N. Y. • SALES OFFICES IN PRINCIPAL CITIES

Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

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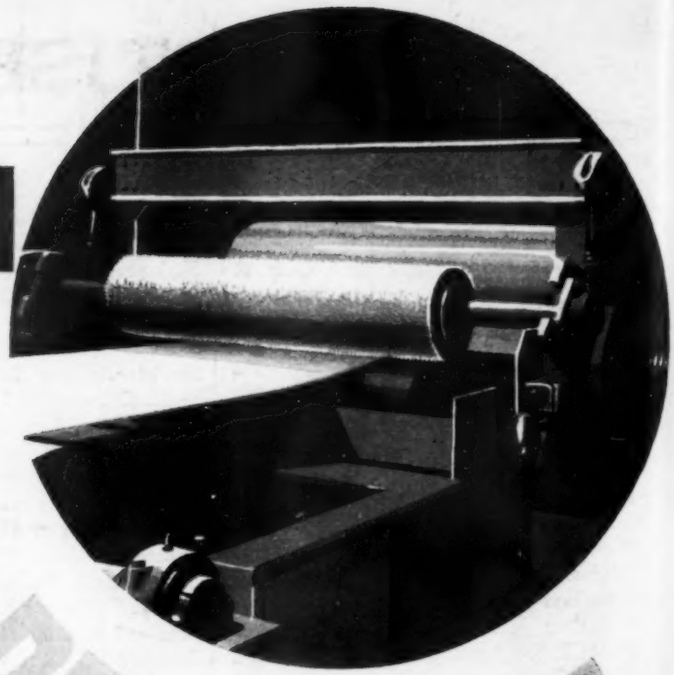
How to give a cold rolled strip the BRUSH-OFF



● A characteristic problem of cold roll strip production is the removal of oil and other foreign matter. Pittsburgh has solved this by a 3-color, dense filled, medium stiff brush. This special brush of even trim, spiral wound, removes all rolling oil and other foreign matter after the strip has passed through a heated alkaline bath and been sprayed by clear water.

Such a brush has to take plenty of punishment for it is constantly subjected to both the softening effect of water and rapid friction of the strip. Brushes by Pittsburgh are skillfully and durably built to withstand this heavy going.

Why the Pittsburgh Plate Glass Company Makes Brushes

As a leading manufacturer of paints, Pittsburgh found that a reliable source of quality brushes was necessary for the proper application of its products. For over 40 years, Pittsburgh has made its own paint brushes. It was a natural step to extend its engineering and manufacturing facilities by developing production, maintenance and power-driven brushes engineered to the specific needs of industry.

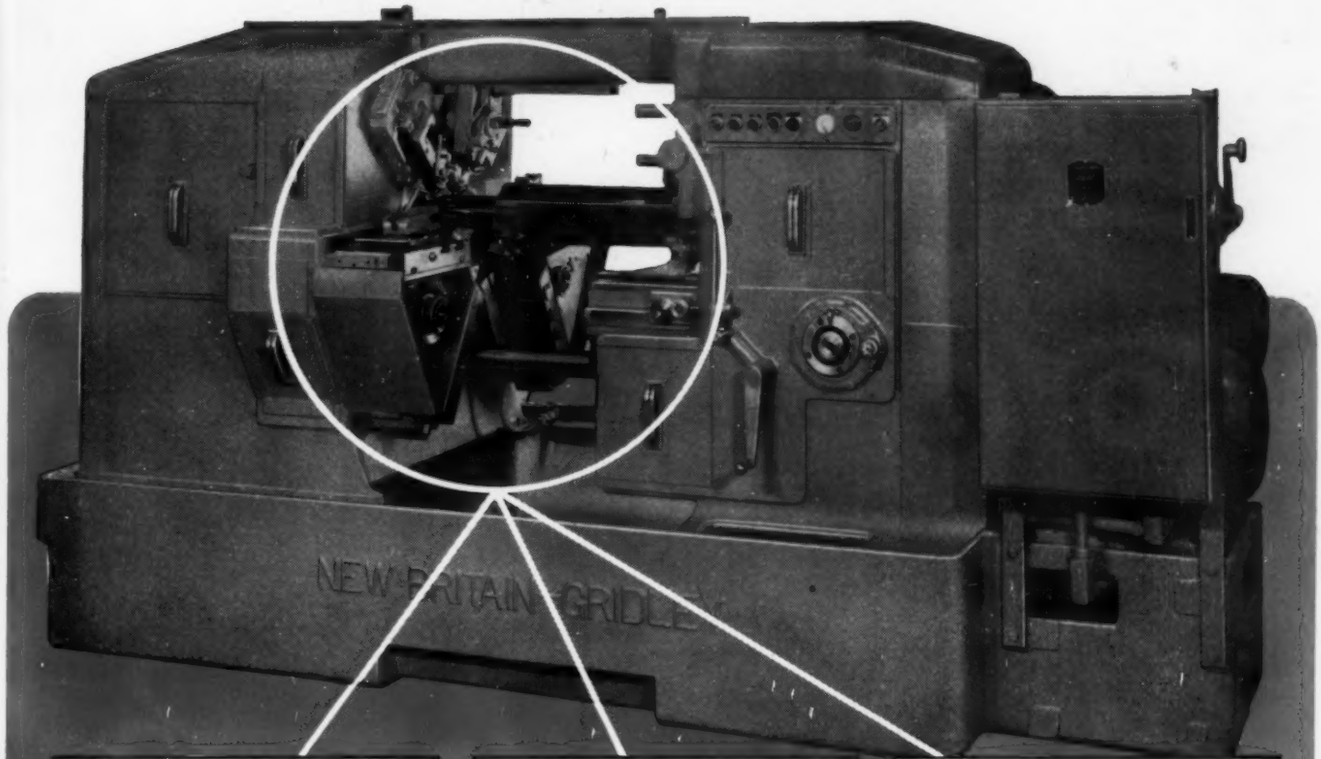
It pays to use power-driven brushes by Pittsburgh

● You can depend on Brushes by Pittsburgh for top performance, enduring economy, and a minimum of lost time in changeovers. In the complete Pittsburgh line are brushes of all types, including "Perfect Balance" sections, wheels and section assemblies, Uni-Fill scratch brushes, as well as paint and other maintenance brushes. ● Consult the Pittsburgh engineering representative. He will gladly work with you in developing any type of power-driven brushes to meet your particular finishing requirements.

PITTSBURGH
PLATE GLASS COMPANY *Brush Division*
3221 FREDERICK AVENUE · BALTIMORE—29 · MARYLAND

NEW BRITAIN'S NEW LINE OF SCREW MACHINES

Answers the Need for Lower Costs and Higher Productivity



QUICK SET UP

1. No cam to change for main tool slide. Strong, positive universal cam selects feed stroke without changing high point, stops or total stroke.
2. No cam to change when adjusting stock feed-out length.
3. Cross slide cams directly behind slides minimizing linkage. Remove three screws with cover and cams pull off.
4. Micrometer adjustment in both directions on all cross slides, all independent of stops.

SYMMETRICAL RADIAL TOOLING

1. Five heavy-duty forming slides and cut off slide evenly spaced about carrier making line of forming thrust identical in each position.
2. Tool holders interchangeable among forming slides, also on main tool slide.
3. Greatly increased chip clearance and capacity so essential with carbides.
4. Flexibility for auxiliary threading attachments. Accelerating drives in every position.

FOOLPROOF, AUTOMATIC OPERATION

1. Shoulder height, complete control panels at front and rear of machine.
2. Automatic stop shuts off machine and flashes red light when spindle is empty.
3. Program wheel on outside of powercase shows complete cycle of machine.
4. Machine stops if lubricating oil pressure is low.
5. Gage indicates when machine is operating at other than normal load.

Fast, powerful machines which will outperform anything modern tools will handle and anticipate future tool developments. These new machines with their initial and permanent accuracy also incorporate all the previous exclusive features by which NEW BRITAINS are recognized. To these qualities have been added new features, making it possible to accomplish quick setups where short runs are the rule. Built massive to handle the horsepower required for steady feeds for carbides on tough forming steel jobs, they are also designed for super high-spindle speeds, essential for brass and aluminum. Six spindles up to 2¼" capacity.

THE NEW BRITAIN MACHINE CO.

NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

M-01062

Stainless steel bars ...ready to ship to you now!

Wide range of sizes

SMALL orders or emergency requirements of Timken fine stainless steel bars can now be shipped to you within 24 hours after receipt of your order. Mill stock includes sizes from $\frac{3}{16}$" to 6".

If you're apt to need stainless bars or tubes in a hurry, better let us send you our mill stock list which will keep you posted on the Timken stainless steel that's immediately available.

When you get that quick delivery of Timken stainless, note how its unvarying uniformity lets you stick to one machining set-up all through the job. Take a look at your chips; you'll see that Timken stainless machines freely. Note how you get sure uniform response to heat treatment . . . and of course, the physical properties and corrosion resistance that made you select stainless in the first place.

For full information on "quick delivery" stock and other Timken stainless, write the Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

"16-25-6"—the steel that made jet propulsion possible, was developed by Timken. You profit from that same skill and experience when you use Timken stainless.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

TIMKEN

TRADE-MARK REG U S PAT OFF

Fine Alloy

STEEL

and Seamless Tubes

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.